DEPARTMENT OF THE ARMY
Omaha District, Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

:NOTICE: Failure to acknowledge : :all amendments may cause rejec- : :tion of the offer. See FAR : :52.215-1 of Section 00100 :	Solicitation No. W9128F 04 R 0012 Date of Issue: 15 SEP 2004 Date of Receiving Proposals: 09 NOV 2004

Amendment No. 0001
14 October 2004

SUBJECT: Amendment No. 0001 to specification and drawings for Construction of CHAPEL CENTER, CRWU 04-3006, BUCKLEY AFB, COLORADO. Solicitation No. W9128F 04 R 0012.

TO: Prospective Offerors and Others Concerned

1. The specifications and drawings for subject project are hereby modified as follows (revise all specification indices, attachment lists, and drawing indices accordingly).

a. Specifications. (Descriptive Changes.)

(1) Project Table of Contents, Page 1, for both Volumes 1 and 2, under heading "Project Table of Contents", insert:

"NOTE: THE CONTRACTOR SHALL OBTAIN MATERIALS IN COMPLIANCE WITH THE BUY AMERICAN ACT PER THE REQUIREMENTS OF SECTION 00700 CONTRACT CLAUSES. APPROVED EXCEPTIONS TO THE BUY AMERICAN ACT ARE PROVIDED IN SECTION 00800 SPECIAL CONTRACT REQUIREMENTS."

(2) Section 00800, Page 19, following paragraph 1.38, add:

"1.39 BUY AMERICAN ACT

1.39.1 General Requirements

The Contractor shall obtain materials in compliance with the Buy American Act per the requirements of Section 00700 Contract Clauses. The Buy American Clauses to be utilized for this contract are based on the contract price submitted in response to this solicitation. Buy American Act clauses with associated price ranges are listed below:

FAR 52.225-9 BUY AMERICAN ACT-CONSTRUCTION MATERIALS and FAR 52.225-10 NOTICE OF BUY AMERICAN ACT REQUIREMENT-CONSTRUCTION MATERIALS are applicable For Contracts less than $6.481 million.

FAR 52.225-11 BUY AMERICAN ACT-CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS [For Contracts more than $6,481,000] ALTERNATE I (JAN 2004) [For Contracts between $6.481 and $7.304733 Million] and FAR 52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT-CONSTRUCTION MATERIALS UNDER

TRADE AGREEMENTS [Applicable with FAR 52.225-11] ALTERNATE II (JAN 2004) [For Contracts Between $6.481 and $7.344733 Million]

1.39.2 Exceptions

The Contracting Officer has determined foreign construction materials listed below may be acquired without regard to the restrictions of the Buy American Act:

Carbon Monoxide Detectors
Fluorescent Lamps
Composting Toilet
Type A (woven mat) Bank Stabilization Fabric
Ceiling Fans with Light Kits".

(3) Section 01330 attachment, delete the Submittal Register in its entirety and substitute the attached revised Submittal Register.

(4) **Sections 02300 (SD-06), 02370A (SD-02, SD-03, SD-04, and SD-06), 02510A (SD-03 and SD-06), 02531 (SD-03), 02556A (SD-03), 02742N (SD-05), 02754A (SD-03), 02768 (SD-03 and SD-08), 02811A (SD-03 and SD-06), 02870 (SD-03 and SD-04), 02921A (SD-03, SD-04, SD-06 and SD-07), 02930A(SD-03, SD-04, SD-06 and SD-07), 02935A (SD-07), 03101A(SD-06), 03300(SD-06), 03481(SD-03), 04200(SD-03, SD-04, SD-05, and SD-06), 04730 (SD-06), 05090A (SD-03), 05120 (SD-03), 06410A (SD-07), 07131(SD-03), 07190(SD-03), 07416A(SD-04), 07546(SD-03), 07840(SD-02), 07920(SD-03), 08110(SD-02), 08330A(SD-04), 08520A(SD-06 and SD-07), 08800(SD-04 and SD-07), 08951(SD-02 and SD-06), 09100N(SD-07), 09310(SD-07), 09510(SD-06), 09650(SD-06), 09680(SD-03, SD-06 and SD-07), 09840A(SD-06), 09900(SD-03, SD-07 and SD-10), 10430(SD-03), 10800(SD-04), 11041(SD-04), and 12490(SD-03, SD-04, and SD-06)**, submittal paragraph of each section, revise submittal items, classifications and reviewers for various submittal items for the submittal description (SD) indicated above to match those shown on the Submittal Register issued with this amendment. In most cases, only the reviewer classification was changed.

(5) Section 02915A, delete this section in its entirety.

(6) Section 13851A, Page 7, following paragraph 1.3.7.3, add:

"1.3.8 Sole Source Requirements

Notwithstanding Section 00700 Contract Clauses clause "FAR 52.236-5, Material and Workmanship", the fire alarm system RF transmitter model "MuxPad II - RF" shall be manufactured by "Digitize Inc." in order that the facility fire alarm system be compatible with the Buckley AFB fire alarm reporting system. No other product will be acceptable. The Competition Advocate authorizes sole source procurement."

b. Specifications (New and/or Revised and Reissued). Delete and substitute or add specification pages as noted below. The substituted pages are revised and reissued with this amendment.

Pages Deleted	Pages Substituted or Added
---	Section 08710, Pages 11 thru 22
---	Section 13110A, Pages 1 thru 24

c. Drawings (Not Reissued). The following sheets of drawing code AF 730-17-01 are revised as indicated below with latest revision date of 14 October 2004. These drawings are not reissued with this amendment.

(1) Sheet C100.

(a) Drawing coordinate B-4, NOTE, delete note 1 in its entirety.
(b) Two (2) notes reading "CLEAR AND GRUB EXISTING SHRUBS. SEE NOTES THIS SHEET", delete "SEE NOTES THIS SHEET" (each note).

(2) Sheet LS04, LANDSCAPE PLAN – "ENHANCEMENT" detail A, revise title of the detail to read "LANDSCAPING PLAN – OPTION #5".

2. This amendment is a part of the proposing papers and its receipt shall be acknowledged on the [new] Standard Form 1442. All other conditions and requirements of the specifications remain unchanged. If the proposals have been mailed prior to receiving this amendment, you will notify the office where proposals are received, in the specified manner, immediately of its receipt and of any changes in your proposal occasioned thereby.

a. Hand-Carried Proposals shall be delivered to the U.S. Army Corps of Engineers, Omaha District, Contracting Division (Room 301), 106 South 15th Street, Omaha, Nebraska 68102-1618.

b. Mailed Proposals shall be addressed as noted in Item 8 on Page 00010-1 of Standard Form 1442.

3. Offers will be received until 2:00 p.m., local time at place of receiving proposals, 09 NOV 2004.

Attachments:

Submittal Register (Attachment to Section 01330)
Spec Pages listed in 1.b. above

U.S. Army Engineer District, Omaha
Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

14 October 2004
DRL/4547

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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Chapel Center, Buckley AFB, Colorado

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		00800	SD-02 Shop Drawings														
			Equipment Room Drawings		G AO												
		01200	SD-11 Closeout Submittals														
			Equipment Warranty Booklet	1.2.5													
		02231	SD-03 Product Data														
			Nonsaleable Materials	3.5.1	G AO												
			SD-04 Samples														
			Tree wound paint	2.1	G AO												
			Herbicide	2.2	G A0												
		02300	SD-01 Preconstruction Submittals														
			Shoring	3.5	G AO												
			Dewatering Work Plan	1.6	G AO												
			SD-03 Product Data														
			Utilization of Excavated Materials	3.9	G AO												
			Opening of any Excavation or	3.4	G AO												
			Borrow Pit														
			Shoulder Construction	3.15	G AO												
			SD-06 Test Reports														
			Testing	3.18	G AO												
			SD-07 Certificates														
			Testing	3.18	G AO												
		02370A	SD-02 Shop Drawings														
			Layout	3.2.2	G AE												
			Obstructions Below Ground	3.2.4	G AO												
			Erosion Control	3.2.2	G AO												
			Seed Establishment Period	2.5.12.1	G A0												

Am #0001

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		02370A	Maintenance Record	3.6	G	AO												
			SD-03 Product Data															
			Geosynthetic Binders	2.2.2	G	AO												
			Hydraulic Mulch	2.3.10	G	AO												
			Geotextile Fabrics	2.4	G	AO												
			Synthetic Grid Systems	2.6.1	G	AO												
			Articulating Cellular Concrete	2.9	G	AO												
			Block Systems															
			Equipment	1.3	G	AO												
			Finished Grade	3.1.1	G	AE												
			Erosion Control Blankets	2.5	G	AE												
			SD-04 Samples															
			Materials	1.4	G	AO												
			SD-06 Test Reports															
			Geosynthetic Binders	2.2.2	G	AO												
			Hydraulic Mulch	2.3.10	G	AO												
			Geotextile Fabrics	2.4	G	AO												
			Erosion Control Blankets	2.5	G	AO												
			Synthetic Grid Systems	2.6.1	G	AO												
			Articulating Cellular Concrete	2.9	G	AO												
			Block Systems															
			Sand	2.8	G	AO												
			Gravel	2.8	G	AO												
			SD-07 Certificates															
			Fill Material	3.3.12.1	G	AO												
			Mulch	2.3	G	AO												

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		02370A	Hydraulic Mulch	2.3.10	G	AO												
			Geotextile Fabrics	2.4	G	AO												
			Geosynthetic Binders	2.2.2	G	AO												
			Synthetic Soil Binders	2.2.1	G	AO												
			Erosion Control Plan	3.1	G	AO												
			Construction Work Sequence	3.1	G	AO												
			Schedule															
			Installer's Qualification	1.6	G	AO												
			Recycled Plastic	2.1	G	AO												
			Seed	2.5.12	G	AO												
			Asphalt Adhesive	2.3.8	G	AO												
			Tackifier	2.3.11	G	AO												
			Wood By-Products	2.3.6	G	AO												
			Wood Cellulose Fiber	2.3.3	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Instructions	3.6.1.1	G	AO												
		02466A	SD-02 Shop Drawings															
			Caissons	3.1	G	AE												
			SD-07 Certificates															
			Caissons	3.1	G	AO												
			Qualifications	1.5	G	AO												
		02510A	SD-03 Product Data															
			Installation	3.1	G	AO												
			Waste Water Disposal Plan	3.2	G	AO												
			Satisfactory Installation	3.4	G	AO												

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		02510A	SD-06 Test Reports															
			Bacteriological Disinfection	3.3	G	AO												
			SD-07 Certificates															
			Manufacturer's Representative	1.3	G	AO												
			Installation	3.1	G	AO												
		02531	SD-03 Product Data															
			Pipeline materials	2.1	G	AE												
			SD-07 Certificates															
			Gaskets	2.1.4.2	G	AO												
		02556A	SD-02 Shop Drawings															
			Pipe, Fittings, and Associated	2.1	G	AE												
			Materials															
			SD-03 Product Data															
			Materials and Equipment	1.3.2	G	AO												
			Spare Parts	1.3.5	G	AO												
			Connections to Existing Lines	3.9	G	AO												
			Jointing Polyethylene Piping	1.3.1	G	AO												
			Connection Plan	3.9.1	G	AO												
			SD-06 Test Reports															
			Pressure and Leak Tests	3.10.2	G	AO												
			SD-07 Certificates															
			Training	1.3.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Gas Distribution System	3.5	G	AO												
		02630	SD-03 Product Data															

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		02630	Placing Pipe and trench drains	3.3	G	AE												
			SD-04 Samples															
			Pipe for Culverts and Storm Drains	2.1	G	AO												
			Trench drain frame and grate	3.3.5	G	AE												
			SD-07 Certificates															
			Resin Certification	2.1.4	G	AO												
			Resin Certification	2.1.5	G	AO												
			Pipeline Testing	3.8	G	AO												
			Hydrostatic Test on Watertight Joints	2.7	G	AO												
			Determination of Density	3.7.5	G	AO												
			Frame and Cover for Gratings	2.3.3	G	AO												
			Polydrain Trench Drain System	3.3.6	G	AO												
		02742N	SD-05 Design Data															
			Job-mix formula	1.3.3	G	AE												
			ASPHALT CEMENT BINDER	2.2	G	AO												
			MIX DESIGN	2.3	G	AE												
			SD-06 Test Reports															
			Specific gravity test of asphalt	2.5.1	G	AO												
			Coarse aggregate tests	2.5.1	G	AO												
			Weight of slag test	2.5.1	G	AO												
			Percent of crushed pieces in gravel	2.5.1	G	AO												
			Fine aggregate tests	2.5.1	G	AO												
			Specific gravity of mineral filler	2.5.1	G	AO												

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		02742N	Bituminous mixture tests	2.5.1	G	AO												
			Aggregates tests	3.5.2.1	G	AO												
			Bituminous mix tests	3.5.2.2	G	AO												
			Pavement courses	3.5.2.3	G	AO												
		02744N	SD-06 Test Reports															
			emulsified asphalt	2.1.1	G	AO												
		02754A	SD-03 Product Data															
			Equipment	1.6	G	AO												
			Paving	3.4	G	AO												
			Mixture Proportions	2.11	G	AO												
		02763A	SD-03 Product Data															
			Equipment	1.4	G	AO												
			Qualifications	1.7	G	AO												
			SD-06 Test Reports															
			Sampling and Testing	2.2	G	AO												
		02768	SD-02 Shop Drawings															
			Stamped Pattern Concrete	2.1	G	AE												
			Pavement															
			Stamped Pattern Concrete	3.12.1	G	AE												
			Pavement															
			SD-03 Product Data															
			Synthetic Fibers for Reinforcing	2.4	G	AO												
			Synthetic Fibers for Reinforcing	2.8.3	G	AO												
			Color Pigment	2.3.1	G	AE												
			Color Pigment	2.8.4	G	AE												

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		02768	Pigmented Mineral Dry-Shake	2.3.2	G	AO												
			Hardener															
			Pigmented-Powder Release	2.3.3	G	AO												
			Agent															
			Liquid Release Agent	2.3.4	G	AO												
			Imprinting Tools	2.5	G	AO												
			Evaporation Retarder	2.6.2	G	AO												
			Clear Acrylic Sealer	2.6.3	G	AO												
			Bonding Agent	2.7	G	AO												
			Bonding Agent	3.4.1.1	G	AO												
			Mixture Proportions	2.8.1	G	AO												
			SD-07 Certificates															
			Qualifications	1.5	G	AO												
			Cementitious materials	2.8.2	G	AO												
			Synthetic Fibers for Reinforcing	2.4	G	AO												
			Synthetic Fibers for Reinforcing	2.8.3	G	AO												
			Pigmented Mineral Dry-Shake	2.3.2	G	AO												
			Hardener															
			Bonding Agent	2.7	G	AO												
			Bonding Agent	3.4.1.1	G	AO												
			SD-08 Manufacturer’s Instructions															
			Stamped Pattern Concrete	2.1	G	AO												
			Pavement															
			Stamped Pattern Concrete	3.12.1	G	AO												
			Pavement															
		02770A	SD-03 Product Data															

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		02770A	Concrete	2.1	G	AO												
			SD-06 Test Reports															
			Field Quality Control	3.8	G	AO												
		02811A	SD-02 Shop Drawings															
			Sprinkler System	3.1	G	AE												
			SD-03 Product Data															
			Framed Instructions	3.3	G	AO												
			Sprinkler System	3.1	G	AO												
			Spare Parts	2.1.3	G	AO												
			SD-06 Test Reports															
			Field Tests	3.2	G	AO												
			SD-07 Certificates															
			Sprinkler System	3.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Sprinkler System	3.1	G	AO												
		02870	SD-02 Shop Drawings															
			Benches	2.5	G	AE												
			Assembly Instruction Drawings	1.4.2														
			SD-03 Product Data															
			Benches	2.5	G	AO												
			SD-04 Samples															
			Finish	2.3.3	G	AO												
			SD-07 Certificates															
			Primer certificate	1.4.3														
			Powder coatings certificate	1.4.4														

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		02921A	SD-03 Product Data															
			Surface Erosion Control Material	2.6	G	AO												
			Delivery	1.4.1	G	AO												
			Topsoil	1.4.1.1	G	AO												
			Topsoil	2.2	G	AO												
			Quantity Check	3.5	G	AO												
			Seed Establishment Period	3.8	G	AO												
			Maintenance Record	3.8.3.4	G	AO												
			SD-04 Samples															
			Soil Amendments	2.3	G	AO												
			Mulch	2.4	G	AO												
			SD-06 Test Reports															
			Equipment Calibration	3.1.3	G	AO												
			Soil Test	3.1.4	G	AO												
			SD-07 Certificates															
			Seed	2.1	G	AO												
			pH Adjuster	2.3	G	AO												
			Fertilizer	2.3.1	G	AO												
			Organic Material	2.3.2	G	AO												
			Mulch	2.4	G	AO												
		02930A	SD-02 Shop Drawings															
			Shop Drawings	3.3.1	G	AE												
			SD-03 Product Data															
			Geotextile	2.6	G	AO												
			Delivery	1.4.1	G	AO												
			Maintenance Record	3.9.2.6	G	AO												

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		02930A	Application of Pesticide	3.7	G	AO												
			SD-04 Samples															
			Delivered Topsoil	1.4.1.3	G	AO												
			Soil Amendments	3.1.4.2	G	AO												
			Mulch	2.4	G	AO												
			Geotextile	2.6	G	AO												
			SD-06 Test Reports															
			Soil Test	3.1.4.2	G	AO												
			Percolation Test	3.1.4.1	G	AO												
			SD-07 Certificates															
			Plant Material	2.1	G	AO												
			Topsoil	2.2	G	AO												
			pH Adjuster	2.3.1	G	AO												
			Fertilizer	2.3.2	G	AO												
			Organic Material	2.3.3	G	AO												
			Organic Mulch	2.4.2	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Instructions	3.9.5	G	AO												
		02935A	SD-03 Product Data															
			Chemical Treatment Material	1.3.3	G	AE												
			Delivery Schedule	1.3.1	G	AE												
			Maintenance Record	3.5.4	G	AE												
			Application of Pesticide	3.4	G	AE												
			SD-07 Certificates															
			Fertilizer	2.1.1	G	AO												

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		02935A	Mulch	2.2	G	AO												
			Pesticide	2.4	G	AO												
		03101A	SD-03 Product Data															
			Materials	2.1	G	AE												
			SD-06 Test Reports															
			Inspection	3.3	G	AO												
			Formwork Not Supporting Weight of Concrete	3.2.1	G	AO												
		03200A	SD-02 Shop Drawings															
			Reinforcement	3.1	G	AE												
			SD-03 Product Data															
			Welding	1.3	G	AO												
			SD-07 Certificates															
			Reinforcing Steel	2.3	G	AO												
		03300	SD-03 Product Data															
			Mixture Proportions	1.8	G	AE												
			Vapor Barrier	2.13	G	AE												
			SD-04 Samples															
			Integral Color	2.6	G	AE												
			SD-06 Test Reports															
			Testing and Inspection for Contractor Quality Control	3.14	G	AO												
			Testing for Vapor Emission of Floor Slabs	3.14.12.1	G	AO												
			Testing for Alkalinity of Floor Slabs	3.14.12.2	G	AO												

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		03300	SD-07 Certificates															
			Qualifications	1.4	G	AO												
		03481	SD-03 Product Data															
			Splash Blocks	2.1	G	AO												
		04200	SD-02 Shop Drawings															
			Structural Masonry	1.4	G	AE												
			SD-03 Product Data															
			Cold Weather Installation	3.1.2	G	AO												
			SD-04 Samples															
			Anchors, Ties, and Bar	2.6	G	AO												
			Positioners															
			Expansion-Joint Materials	2.10	G	AE												
			Joint Reinforcement	2.7	G	AO												
			SD-05 Design Data															
			Pre-mixed Mortar	2.4.5	G	AE												
			Unit Strength Method	1.4.2	G	AO												
			SD-06 Test Reports															
			Field Testing of Mortar	3.19.1	G	AO												
			Field Testing of Grout	3.19.2	G	AO												
			Prism tests	3.19.3	G	AO												
			Masonry Cement	2.4.4	G	AO												
			Fire-rated CMU	2.2.3	G	AO												
			Special Inspection	1.4.1	G	AE												
			SD-07 Certificates															
			Concrete Masonry Units (CMU)	2.2	G	AO												
			Control Joint Keys	2.9	G	AO												

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		04200	Anchors, Ties, and Bar	2.6	G	AO												
			Positioners															
			Expansion-Joint Materials	2.10	G	AO												
			Joint Reinforcement	2.7	G	AO												
			Reinforcing Steel Bars and Rods	2.8	G	AO												
			Masonry Cement	2.4.4	G	AO												
			Mortar Coloring	2.4.2	G	AO												
			Admixtures for Masonry Mortar	2.4.1	G	AO												
			Admixtures for Grout	2.5.1	G	AO												
			SD-08 Manufacturer's Instructions															
			Masonry Cement	2.4.4														
		04730	SD-03 Product Data															
			Simulated Stone	2.1	G	AE												
			SD-04 Samples															
			Simulated Stone	2.1	G	AE												
			Portable Panel	1.3	G	AE												
			SD-06 Test Reports															
			Simulated Stone	2.1	G	AO												
			SD-07 Certificates															
			Simulated Stone	2.1	G	AO												
			Mortar Coloring	2.2.1	G	AO												
			Metal Lath	2.3	G	AO												
			Masonry Cement	2.2.4	G	AO												
			Weather Resistant Barrier	2.5	G	AO												
			SD-08 Manufacturer's Instructions															
			Simulated Stone	2.1														

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		04730	SD-10 Operation and Maintenance														
			Data														
			Simulated Stone	2.1													
		05090A	SD-03 Product Data														
			Welding Procedure Qualifications	1.5	G AO												
			Welder, Welding Operator, and	1.6	G AO												
			Tacker Qualification														
			Inspector Qualification	1.7	G AO												
			Previous Qualifications	1.5.1	G AO												
			Prequalified Procedures	1.5.2	G AO												
			SD-06 Test Reports														
			Quality Control	3.2	G AO												
		05120	SD-02 Shop Drawings														
			Erection Plan	1.6.2.1	G AE												
			Fabrication drawings	1.6.1	G AE												
			SD-03 Product Data														
			Shop primer	2.4	G AO												
			Load indicator washers	2.2.5	G AO												
			Load indicator bolts	2.2.6	G AO												
			SD-06 Test Reports														
			Class B coating	2.4	G AO												
			Bolts, nuts, and washers	2.2	G AO												
			SD-07 Certificates														
			Steel	2.1													
			Bolts, nuts, and washers	2.2	G AO												
			Shop primer	2.4	G AO												

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		05120	Welding electrodes and rods	2.3.1	G	AO												
			Nonshrink grout	2.3.2	G	AO												
			Galvanizing	2.5	G	AO												
			AISC Quality Certification	1.5	G	AO												
			Welding procedures and	1.6.2.2	G	AO												
			qualifications															
		05210A	SD-02 Shop Drawings															
			Steel Joists	1.3	G	AE												
			SD-05 Design Data															
			Steel Joists	1.3	G	AE												
			SD-07 Certificates															
			Steel Joists	1.3	G	AE												
		05310	SD-02 Shop Drawings															
			Fabrication Drawings	1.3.5	G	AE												
			SD-03 Product Data															
			Deck Units	2.3.1	G	AE												
			Sound Absorbing Material	2.1.3	G	AE												
			Accessories	2.2	G	AE												
			SD-05 Design Data															
			Deck Units	2.3.1	G	AE												
			SD-07 Certificates															
			Deck Units	2.3.1	G	AO												
			Accessories	2.2	G	AO												
			Qualification of Welders	1.3.3	G	AO												
			Fire Safety	1.3.4.1	G	AO												
			Wind Storm Resistance	1.3.4.2	G	AO												

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		05400	SD-02 Shop Drawings															
			Framing Components	1.6.1	G	AE												
			SD-03 Product Data															
			studs,joists	2.1	G	AE												
			SD-07 Certificates															
			Load-bearing cold-formed metal framing	1.4	G	AO												
			Welds	3.1.1	G	AO												
		05500A	SD-02 Shop Drawings															
			Miscellaneous Metal Items	1.6	G	AE												
			SD-04 Samples															
			Miscellaneous Metal Items	1.6	G	AE												
		06100A	SD-07 Certificates															
			Grading and Marking	2.1.1	G	AO												
		06200A	SD-02 Shop Drawings															
			Finish Carpentry	2.1	G	AE												
			SD-03 Product Data															
			Wood Items, and Trim	2.1	G	AE												
			SD-04 Samples															
			Moldings	2.1.4	G	AE												
		06410A	SD-02 Shop Drawings															
			Shop Drawings	1.5	G	AE												
			Shop Drawings	1.8	G	AE												
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Wood Materials	2.1	G	AE												

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		06410A	Wood Finishes	2.7	G	AE												
			Finish Schedule	2.8.8.3	G	AE												
			SD-04 Samples															
			Plastic Laminates	2.3	G	AE												
			Cabinet Hardware	2.4	G	AE												
			SD-07 Certificates															
			Quality Assurance	1.4	G	AO												
			Laminate Clad Casework	2.7	G	AO												
			Laminate Clad Casework	3.1	G	AO												
		06650	SD-02 Shop Drawings															
			Shop Drawings	1.7	G	AE												
			Installation	3.2	G	AE												
			SD-03 Product Data															
			Solid polymer material	2.1														
			Qualifications	1.6														
			Fabrications	2.3														
			SD-04 Samples															
			Material	2.1	G	AE												
			Counter and Vanity Tops	2.3.4	G	AE												
			SD-06 Test Reports															
			Solid polymer material	2.1														
			SD-07 Certificates															
			Fabrications	2.3														
			Qualifications	1.6														
			SD-10 Operation and Maintenance															
			Data															

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		06650	Clean-up	3.3														
		07110A	SD-07 Certificates															
			Materials	1.4	G	AO												
		07131	SD-03 Product Data															
			Elastomeric waterproofing sheet	2.1	G	AE												
			material															
			Primers, adhesives, and mastics	2.1														
			SD-06 Test Reports															
			Elastomeric waterproofing sheet	2.1	G	AO												
			material															
		07190	SD-03 Product Data															
			Water repellents	2.2	G	AO												
			SD-06 Test Reports															
			Water absorption	1.3.2	G	AO												
			Water absorption	2.3.1	G	AO												
			Accelerated weathering	2.3.1	G	AO												
			Resistance to chloride ion	2.3.1	G	AO												
			penetration															
			Moisture vapor transmission	1.3.2	G	AO												
			Moisture vapor transmission	2.3.1	G	AO												
			Scaling resistance	2.3.1	G	AO												
			Water Penetration and Leakage	1.3.2	G	AO												
			SD-07 Certificates															
			Manufacturer's qualifications	1.3.1	G	AO												
			Applicator's qualifications	1.3.1	G	AO												
			Evidence of acceptable variation	1.3.3	G	AO												

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		07190	Warranty	1.12														
			SD-08 Manufacturer's Instructions															
			Application	3.4														
			material safety data sheets	1.7.1														
		07214N	SD-03 Product Data															
			Block or board insulation	2.1	G	AE												
			Accessories	2.2	G	AE												
			SD-08 Manufacturer's Instructions															
			Block or Board Insulation	2.1														
			Adhesive	2.2.1														
		07220	SD-02 Shop Drawings															
			Wood nailers	2.3	G	AE												
			Tapered roof insulation	2.1.4	G	AE												
			SD-03 Product Data															
			Fasteners	2.2	G	AE												
			Insulation	2.1	G	AE												
			SD-06 Test Reports															
			Flame spread and smoke	1.4.1	G	AO												
			developed ratings															
			SD-07 Certificates															
			qualifications	1.3	G	AO												
			SD-08 Manufacturer's Instructions															
			fasteners	2.2														
			insulation	2.1														
		07416A	SD-02 Shop Drawings															

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		07416A	Structural Standing Seam Metal	1.2.1	G	AE												
			Roof (SSSMR) System															
			Snow Guards	2.13	G	AE												
			Ice and Water Shield	2.11	G	AE												
			Ice and Water Shield	2.11.1	G	AE												
			SD-03 Product Data															
			Design Analysis	2.4	G	AE												
			SD-04 Samples															
			Accessories	2.3	G	AO												
			Roof Panels	2.1	G	AO												
			Factory Color Finish	2.6	G	AE												
			Fasteners	2.4	G	AO												
			Insulation	2.7	G	AO												
			Gaskets and Insulating	2.10	G	AO												
			Compounds															
			Sealant	2.9	G	AO												
			Concealed Anchor Clips	2.2	G	AO												
			Subpurlins	2.5	G	AO												
			EPDM Rubber Boots	2.12	G	AO												
			Snow Guards	2.13	G	AO												
			SD-06 Test Reports															
			Test Report for Uplift Resistance	2.4	G	AO												
			of the SSSMR															
			SD-07 Certificates															
			Structural Standing Seam Metal		G	AO												
			Roof System															

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		07416A	Insulation	2.7	G	AO												
			Ice and Water Shield	2.11	G	AO												
			Ice and Water Shield	2.11.1	G	AO												
			SD-08 Manufacturer's Instructions															
			Ice and Water Shield	2.11														
			Ice and Water Shield	2.11.1														
		07546	SD-02 Shop Drawings															
			Roofing System	1.3.2	G	AE												
			SD-03 Product Data															
			Installation	3.3														
			Protection of Finished Roofing	3.4	G	AO												
			Inspection	3.5	G	AO												
			SD-07 Certificates															
			Materials	1.3.1	G	AO												
			Qualifications	1.3.5	G	AO												
		07600	SD-02 Shop Drawings															
			Covering on flat, sloped, or	3.1.19	G	AE												
			curved surfaces															
			Gutters	3.1.13	G	AE												
			Downspouts	3.1.14	G	AE												
			Splash pans	3.1.17	G	AE												
			Flashing for roof drains	3.1.15	G	AE												
			Base flashing	3.1.9	G	AE												
			Counterflashing	3.1.10	G	AE												
			Reglets	3.1.11	G	AE												
			Scuppers	3.1.16	G	AE												

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		07600	Copings	3.1.20	G	AE												
			Eave flashing	3.1.18	G	AE												
		07840	SD-02 Shop Drawings															
			Firestopping Materials	2.1	G	AO												
			SD-07 Certificates															
			Firestopping Materials	2.1	G	AO												
			Installer Qualifications	1.5	G	AO												
			Inspection	3.3	G	AO												
		07920	SD-03 Product Data															
			Sealants	2.1	G	AO												
			Primers	2.2	G	AO												
			Bond breakers	2.3	G	AO												
			Backstops	2.4	G	AO												
			SD-07 Certificates															
			Sealant	3.3.6	G	AO												
		08110	SD-02 Shop Drawings															
			Doors	2.1	G	AE												
			Frames	2.5	G	AE												
			Weatherstripping	2.7														
			Schedule of doors		G	AE												
			Schedule of frames		G	AE												
			SD-03 Product Data															
			Doors	2.1	G	AE												
			Frames	2.5	G	AE												
			Weatherstripping	2.7	G	AE												
		08120	SD-02 Shop Drawings															

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		08120	Doors and frames	2.1	G	AE												
			SD-08 Manufacturer's Instructions															
			Doors and frames	2.1														
		08210	SD-02 Shop Drawings															
			Doors	2.1	G	AE												
			SD-03 Product Data															
			Doors	2.1	G	AE												
			Accessories	2.2														
			Water-resistant sealer	2.3.7														
			warranty	1.4														
			SD-04 Samples															
			Doors	2.1														
			Door finish colors	2.3.6.3	G	AE												
			SD-06 Test Reports															
			Split resistance	2.4	G	AO												
			Cycle-slam	2.4	G	AO												
			Hinge loading resistance	2.4	G	AO												
		08330A	SD-02 Shop Drawings															
			Approved Detail Drawings	3.1	G	AE												
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Overhead Rolling Doors	2.1	G	AE												
			SD-04 Samples															
			Overhead Rolling Doors	2.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															

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		08330A	Operation and Maintenance	1.6													
			Manuals														
		08520A	SD-02 Shop Drawings														
			Aluminum Windows	1.2	G AE												
			Aluminum Windows	1.2.4	G AE												
			Aluminum Windows	2.1	G AE												
			Insect Screens	2.3	G AE												
			SD-03 Product Data														
			Aluminum Windows	1.2	G AE												
			Aluminum Windows	1.2.4	G AE												
			Aluminum Windows	2.1	G AE												
			SD-04 Samples														
			Aluminum Windows	1.2	G AE												
			Aluminum Windows	1.2.4	G AE												
			Aluminum Windows	2.1	G AE												
			SD-06 Test Reports														
			Aluminum Windows	1.2	G AO												
			Aluminum Windows	1.2.4	G AO												
			Aluminum Windows	2.1	G AO												
			SD-07 Certificates														
			Aluminum Windows	1.2	G AO												
			Aluminum Windows	1.2.4	G AO												
			Aluminum Windows	2.1	G AO												
		08710	SD-02 Shop Drawings														
			Hardware schedule	1.3	G AE												
			Keying system	2.3.5													

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		08710	SD-03 Product Data															
			Hardware items	2.3	G	AE												
			SD-08 Manufacturer's Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance															
			Data															
			Hardware Schedule	1.3	G	AO												
			SD-11 Closeout Submittals															
			Key bitting	1.4														
		08800	SD-02 Shop Drawings															
			Installation	2.3.8	G	AE												
			Installation	3.2.3	G	AE												
			Installation	3.2.4	G	AE												
			Installation	3.2.5	G	AE												
			SD-03 Product Data															
			Insulating Glass	1.6.1	G	AE												
			Glazing Accessories	1.3	G	AE												
			SD-04 Samples															
			Insulating Glass	1.6.1	G	AE												
			Glazing Compound	2.3.2	G	AE												
			Tape	2.3.5	G	AO												
			Sealant	2.3.3.1	G	AO												
			SD-07 Certificates															
			Insulating Glass	1.6.1	G	AO												
			SD-08 Manufacturer's Instructions															
			Setting and sealing materials	2.3														

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		08800	Glass setting	3.2														
		08951	SD-02 Shop Drawings															
			Fabrication Drawings		G	AE												
			SD-03 Product Data															
			Translucent Fiberglass Sandwich	2.1	G	AE												
			Wall Panels															
			SD-04 Samples															
			Translucent Fiberglass Sandwich	2.1	G	AE												
			Wall Panels															
			SD-06 Test Reports															
			Translucent Fiberglass Sandwich	2.1	G	G												
			Wall Panels															
		09100N	SD-02 Shop Drawings															
			Metal support systems	2.1	G	AE												
			SD-03 Product Data															
			Suspension Systems	2.2	G	AE												
			SD-04 Samples															
			Suspension Systems	2.2	G	AE												
			SD-07 Certificates															
			Suspension Systems	2.2	G	AO												
		09225	SD-02 Shop Drawings															
			Stucco		G	AE												
			SD-03 Product Data															
			Materials	1.3	G	AE												
			SD-04 Samples															
			Colored Stucco Finish Coat	2.2	G	AE												

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		09250	SD-03 Product Data															
			Cementitious backer units	2.1.6	G	AE												
			Glass Mat Water-Resistant Gypsum Tile Backing Board	2.1.4	G	AE												
			Water-Resistant Gypsum Backing Board	2.1.3	G	AE												
			Glass Mat Covered or Reinforced Gypsum Sheathing	2.1.5	G	AE												
			Accessories	2.1.10	G	AE												
			SD-07 Certificates															
			Asbestos Free Materials	2.1	G	AO												
		09310	SD-03 Product Data															
			Tile	2.1	G	AE												
			Setting-Bed	2.2	G	AE												
			Mortar, Grout, and Adhesive	2.4	G	AE												
			SD-04 Samples															
			Tile	2.1	G	AE												
			Mortar	2.4.2	G	AE												
			SD-07 Certificates															
			Tile	2.1	G	AO												
			Mortar, Grout, and Adhesive	2.4	G	AO												
		09510	SD-02 Shop Drawings															
			Approved Detail Drawings	1.3	G	AE												
			SD-03 Product Data															
			Acoustical Units	2.1	G	AE												
			Suspension Systems	2.2	G	AE												

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		09510	SD-04 Samples															
			Acoustical Units	2.1	G	AE												
			SD-06 Test Reports															
			Ceiling Attenuation Class and Test	1.3.1	G	AO												
			SD-07 Certificates															
			Acoustical Units	2.1	G	AO												
		09650	SD-02 Shop Drawings															
			Resilient Flooring and Accessories	2.9	G	AE												
			SD-03 Product Data															
			Resilient Flooring and Accessories	2.9	G	AE												
			Adhesives	2.5														
			SD-04 Samples															
			Resilient Flooring and Accessories	2.9	G	AE												
			SD-06 Test Reports															
			Moisture, Alkalinity and Bond Tests	3.3	G	AO												
			SD-08 Manufacturer's Instructions															
			Surface Preparation	3.2														
			Installation	3.1														
			SD-10 Operation and Maintenance Data															

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		09650	Resilient Flooring and	2.9														
			Accessories															
		09680	SD-02 Shop Drawings															
			Installation	3.4	G	AE												
			Molding	2.4	G	AE												
			SD-03 Product Data															
			Carpet	2.1	G	AE												
			Surface Preparation	3.1	G	AE												
			Installation	3.4	G	AO												
			Regulatory Requirements	1.3	G	AO												
			SD-04 Samples															
			Carpet	2.1	G	AE												
			Molding	2.4	G	AE												
			SD-06 Test Reports															
			Moisture and Alkalinity Tests	3.2	G	AO												
			SD-07 Certificates															
			Carpet	2.1	G	AO												
			Regulatory Requirements	1.3	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Carpet	2.1														
			Cleaning and Protection	3.5														
		09720	SD-03 Product Data															
			Wallcoverings and Accessories	2.1	G	AE												
			Primer and Adhesive	2.2														
			SD-04 Samples															

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		09720	Wallcoverings and Accessories	2.1	G	AE												
			SD-07 Certificates															
			Wallcoverings and Accessories	2.1														
			SD-08 Manufacturer's Instructions															
			Wallcoverings and Accessories	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Wallcoverings	2.1														
		09840A	SD-02 Shop Drawings															
			Approved Detail Drawings	2.2	G	AE												
			SD-03 Product Data															
			Installation	3.2	G	AE												
			Acoustical Wall Panels	2.2	G	AE												
			Acoustic Fiberglass Batts	2.1	G	AE												
			SD-04 Samples															
			Acoustical Wall Panels	2.2	G	AE												
			SD-06 Test Reports															
			Acoustical Wall Panels	2.2	G	AO												
			SD-07 Certificates															
			Acoustical Wall Panels	2.2	G	AO												
		09900	SD-02 Shop Drawings															
			Piping identification	3.10														
			stencil	3.10														
			SD-03 Product Data															
			Coating	2.1	G	AO												

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		09900	Manufacturer's Technical Data	2.1														
			Sheets															
			SD-04 Samples															
			Color	1.9	G	AE												
			SD-07 Certificates															
			Applicator's qualifications	1.3														
			Qualification Testing	1.4.1.2	G	AO												
			SD-08 Manufacturer’s Instructions															
			Mixing	3.6.2														
			Manufacturer's Material Safety	1.7.2														
			Data Sheets															
			SD-10 Operation and Maintenance															
			Data															
			Coatings:	2.1	G	AO												
		10153	SD-02 Shop Drawings															
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Toilet Partition System	1.3	G	AE												
			SD-04 Samples															
			Colors and Finishes	2.4	G	AE												
		10430	SD-02 Shop Drawings															
			Approved Detail Drawings	3.1	G	AE												
			SD-03 Product Data															
			Modular Exterior Signage System	2.1	G	AE												
			Installation	3.1	G	AE												
			Exterior Signage	1.3	G	AE												

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		10430	Wind Load Requirements	1.4	G	AO												
			SD-04 Samples															
			Exterior Signage	1.3	G	AE												
			SD-10 Operation and Maintenance															
			Data															
			Protection and Cleaning	3.1.2														
		10440	SD-02 Shop Drawings															
			Detail Drawings	3.1	G	AE												
			SD-03 Product Data															
			Installation	3.1	G	AE												
			SD-04 Samples															
			Interior Signage	1.3	G	AE												
			SD-10 Operation and Maintenance															
			Data															
			Approved Manufacturer's	3.1														
			Instructions															
			Protection and Cleaning	3.1.2														
		10650A	SD-02 Shop Drawings															
			Operable Partitions	2.2	G	AE												
			SD-03 Product Data															
			Operable Partitions	2.2	G	AE												
			SD-04 Samples															
			Operable Partitions	2.2	G	AE												
			SD-07 Certificates															
			Materials	2.1	G	AO												
			Operable Partitions	2.2	G	AO												

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		10650A	SD-10 Operation and Maintenance														
			Data														
			Operable Partitions	2.2													
		10800	SD-03 Product Data														
			Finishes	2.1.2	G AE												
			Accessory Items	2.2	G AE												
			SD-04 Samples														
			Finishes	2.1.2	G AO												
			Accessory Items	2.2	G AO												
			SD-07 Certificates														
			Accessory Items	2.2													
		11041	SD-02 Shop Drawings														
			Baptistery	2.1	G AE												
			SD-03 Product Data														
			Baptistery	2.1	G AE												
			SD-04 Samples														
			Color Selection Samples		G AE												
			Color Verification Samples		G AE												
			SD-07 Certificates														
			Qualifications	1.4.1	G AO												
			SD-10 Operation and Maintenance														
			Data														
			Baptistery	2.1	G AO												
		11402	SD-03 Product Data														
			Appliances	2.1	G AE												
			SD-08 Manufacturer's Instructions														

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		11402	Appliances	2.1													
			SD-10 Operation and Maintenance														
			Data														
			Appliances	2.1	G AO												
		12490	SD-03 Product Data														
			Window Blinds	2.1	G AE												
			Window Shades	2.2	G AE												
			SD-04 Samples														
			Window Blinds	2.1	G AE												
			Window Shades	2.2	G AE												
			SD-06 Test Reports														
			Window Shades	2.2	G AO												
		13100A	SD-02 Shop Drawings														
			Drawings		G AE												
			SD-07 Certificates														
			Materials	2.1	G AO												
		13110A	SD-02 Shop Drawings														
			Drawings	1.3.8	G AO												
			Contractor's Modifications	1.3.2	G AO												
			SD-03 Product Data														
			Equipment		G AO												
			Spare Parts	3.9	G AO												
			SD-06 Test Reports														
			Tests and Measurements	3.5	G AO												
			Contractor's Modifications	1.3.2	G AO												
			SD-07 Certificates														

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		13110A	Cathodic Protection System		G	AO												
			Services of 'Corrosion Expert'	1.3.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Cathodic Protection System		G	AO												
			Training Course	3.6	G	AO												
		13851A	SD-02 Shop Drawings															
			Fire Alarm Reporting System	1.4.1	G	AE												
			SD-03 Product Data															
			Storage Batteries	2.2	G	AE												
			Voltage Drop		G	AO												
			Special Tools and Spare Parts		G	AO												
			Technical Data and Computer	1.5	G	AO												
			Software															
			Training	3.5	G	AO												
			Testing	3.4	G	AO												
			SD-06 Test Reports															
			Testing	3.4	G	AO												
			SD-07 Certificates															
			Equipment		G	AO												
			Qualifications	1.3.7	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Technical Data and Computer	1.5	G	AO												
			Software															
		13930A	SD-02 Shop Drawings															

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		13930A	Shop Drawings	1.12	G	AE												
			As-Built Drawings	3.11														
			SD-03 Product Data															
			Fire Protection Related Submittals	3.1														
			Sway Bracing	3.4.1	G	AE												
			Materials and Equipment	2.3	G	AE												
			Hydraulic Calculations	1.7	G	AE												
			Spare Parts	1.11														
			Preliminary Tests	3.10	G	AO												
			Final Acceptance Test	3.11	G	AO												
			On-site Training	3.12	G	AO												
			Fire Protection Specialist	1.8	G	AO												
			Sprinkler System Installer	1.9	G	AO												
			SD-06 Test Reports															
			Preliminary Test Report	3.11	G	AO												
			Final Acceptance Test Report	3.11	G	AO												
			SD-07 Certificates															
			Inspection by Fire Protection Specialist	3.3	G	AO												
			SD-10 Operation and Maintenance Data															
			Operating and Maintenance Instructions	3.12	G	AO												
		15070A	SD-02 Shop Drawings															
			Coupling and Bracing	3.1	G	AE												
			Flexible Couplings or Joints	3.3	G	AE												

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		15070A	Equipment Requirements	1.3	G	AE												
			Contractor Designed Bracing	1.2.4	G	AE												
			SD-03 Product Data															
			Coupling and Bracing	3.1	G	AE												
			Equipment Requirements	1.3	G	AE												
			Contractor Designed Bracing	1.2.4	G	AE												
			SD-07 Certificates															
			Flexible Ball Joints	2.2	G	AO												
		15080A	SD-02 Shop Drawings															
			Mica Plates	3.2.2.4	G	AO												
			SD-03 Product Data															
			General Materials	2.1	G	AE												
			SD-04 Samples															
			Thermal Insulation Materials		G	AO												
		15181A	SD-02 Shop Drawings															
			Piping System	2.4	G	AE												
			SD-03 Product Data															
			Materials and Equipment	2.1	G	AE												
			Water Treatment Systems	2.12	G	AE												
			Spare Parts	1.6.3	G	AO												
			Qualifications	1.3	G	AO												
			Field Tests	3.3	G	AO												
			Demonstrations	3.4	G	AO												
			Verification of Dimensions	1.6.1	G	AO												
			SD-06 Test Reports															
			Field Tests	3.3	G	AO												

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		15181A	One-Year Inspection		G	AO												
			SD-07 Certificates															
			Service Organization	2.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation Manuals	3.4	G	AO												
			Maintenance Manuals	3.4	G	AO												
			Water Treatment Systems	2.12	G	AO												
		15182	SD-02 Shop Drawings															
			Refrigerant Piping System	2.1	G	AE												
			SD-03 Product Data															
			Refrigerant Piping System	2.1	G	AE												
			Refrigerant Piping Tests	3.3	G	AO												
			Demonstrations	3.4	G	AO												
			Verification of Dimensions	1.3.1	G	AO												
			SD-06 Test Reports															
			Refrigerant Piping Tests	3.3	G	AO												
			SD-07 Certificates															
			Service Organization		G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.4	G	AO												
			Manuals															
		15190A	SD-02 Shop Drawings															
			Gas Piping System	3.2	G	AE												
			SD-03 Product Data															

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		15190A	Welding	1.3.1	G	AO												
			SD-06 Test Reports															
			Testing	3.14	G	AO												
			Pressure Tests	3.14.1	G	AO												
			Test With Gas	3.14.2	G	AO												
		15400A	SD-02 Shop Drawings															
			Plumbing System	3.8.1	G	AE												
			Electrical Work	1.4	G	AE												
			SD-03 Product Data															
			Plumbing Fixture Schedule	3.9	G	AE												
			Plumbing System	3.8.1	G	AE												
			SD-06 Test Reports															
			Tests, Flushing and Disinfection	3.8	G	AO												
			Test of Backflow Prevention	3.8.1.1	G	AO												
			Assemblies															
			SD-07 Certificates															
			Materials and Equipment	1.3	G	AO												
			Bolts	2.1.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Plumbing System	3.8.1	G	AO												
		15569A	SD-02 Shop Drawings															
			Piping Installation	3.2	G	AE												
			SD-03 Product Data															
			Materials and Equipment	1.3.1	G	AE												
			Spare Parts	1.3.7	G	AO												

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		15569A	Water Treatment System	2.13	G	AE												
			Water Treatment System	2.13	G	AE												
			Heating System Tests	3.7	G	AO												
			Fuel System Tests	3.9	G	AO												
			Unit Heaters	2.6	G	AO												
			Welding	1.3.6	G	AO												
			Qualifications	3.7	G	AO												
			Field Instructions	3.10	G	AO												
			Tests	3.3	G	AO												
			SD-06 Test Reports															
			Heating System Tests	3.7	G	AO												
			Fuel System Tests	3.9	G	AO												
			Water Treatment Testing	3.7.1	G	AO												
			SD-07 Certificates															
			Bolts	2.8.5.3	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.10	G	AO												
			Instructions															
			Water Treatment System	2.13	G	AO												
			Water Treatment System	2.13	G	AO												
		15620A	SD-02 Shop Drawings															
			Drawings		G	AE												
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Refrigeration System	3.1.1	G	AE												

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		15620A	Spare Parts		G AO												
			Posted Instructions	3.5	G AO												
			Verification of Dimensions	1.5.1	G AO												
			Manufacturer's Multi-Year	1.6	G AO												
			Compressor Warranty														
			Factory Tests	2.8	G AO												
			System Performance Tests	3.1.1.2	G AO												
			System Performance Tests	3.4	G AO												
			Demonstrations	3.5	G AO												
			SD-06 Test Reports														
			Factory Tests	2.8	G AO												
			System Performance Tests	3.1.1.2	G AO												
			System Performance Tests	3.4	G AO												
			SD-07 Certificates														
			Refrigeration System	3.1.1	G AO												
			Service Organization	2.1	G AO												
			SD-10 Operation and Maintenance														
			Data														
			Operation Manuals		G AO												
			Maintenance Manuals	3.5	G AO												
		15700A	SD-02 Shop Drawings														
			Drawings		G AE												
			SD-03 Product Data														
			Unitary Equipment		G AE												
			Spare Parts Data		G AO												
			Posted Instructions	3.5	G AO												

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		15700A	Verification of Dimensions	1.5.1	G	AO												
			System Performance Tests	3.4	G	AO												
			Demonstrations	3.5	G	AO												
			SD-06 Test Reports															
			Refrigerant Tests, Charging, and	3.3	G	AO												
			Start-Up															
			System Performance Tests	3.4	G	AO												
			SD-07 Certificates															
			Unitary Equipment		G	AO												
			Service Organization	2.1	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Operation Manuals		G	AO												
			Maintenance Manuals	3.5	G	AO												
		15895A	SD-02 Shop Drawings															
			Drawings	3.1.3	G	AE												
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Components and Equipment	2.1	G	AE												
			Test Procedures		G	AO												
			Welding Procedures		G	AO												
			Diagrams	3.1	G	AO												
			Manufacturer's Experience	2.1	G	AO												
			Welded Joints		G	AO												
			Performance Tests	3.6	G	AO												
			Field Training	3.8	G	AO												

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		15895A	SD-06 Test Reports															
			Performance Tests	3.6	G	AO												
			Testing, Adjusting, and Balancing;															
			G-AO															
			SD-07 Certificates															
			Bolts		G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Operating and Maintenance	3.8	G	AO												
			Instructions															
		15950A	SD-02 Shop Drawings															
			Drawings	1.3.3	G	AE												
			SD-03 Product Data															
			HVAC Control System	1.5	G	AO												
			Service Organizations	2.1	G	AO												
			Equipment Compliance Booklet	1.6	G	AO												
			Commissioning Procedures		G	AO												
			Performance Verification Test	1.6	G	AO												
			Procedures															
			Training Course Requirements	3.7.1	G	AO												
			SD-06 Test Reports															
			Commissioning Report	3.5.3	G	AO												
			Performance Verification Test	3.5.3	G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Operation Manual	1.5	G	AO												

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		15950A	Maintenance and Repair Manual	1.6	G	AO												
		15990A	SD-02 Shop Drawings															
			TAB Schematic Drawings and	3.3	G	AO												
			Report Forms															
			SD-03 Product Data															
			TAB Related HVAC Submittals	3.2	G	AO												
			TAB Procedures	3.5.1	G	AO												
			Calibration	1.4	G	AO												
			Systems Readiness Check	3.5.2	G	AO												
			TAB Execution	3.5.1	G	AO												
			TAB Verification	3.5.4	G	AO												
			SD-06 Test Reports															
			Design Review Report	3.1	G	AO												
			Systems Readiness Check	3.5.2	G	AO												
			TAB Report	3.5.3	G	AO												
			TAB Verification Report	3.5.4	G	AO												
			SD-07 Certificates															
			Ductwork Leak Testing	3.4	G	AO												
			TAB Firm	1.5.1	G	AO												
			TAB Specialist	1.5.2	G	AO												
		15995A	SD-03 Product Data															
			Commissioning Team	3.1	G	AO												
			Tests	3.2	G	AO												
			Pre-Commissioning Checks	3.2.1	G	AO												
			SD-06 Test Reports															
			Test Reports	3.2	G	AO												

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		16070A	SD-02 Shop Drawings															
			Lighting Fixtures in Buildings	3.2	G	AE												
			Equipment Requirements	1.4	G	AE												
			SD-03 Product Data															
			Lighting Fixtures in Buildings	3.2	G	AE												
			Equipment Requirements	1.4	G	AE												
			Contractor Designed Bracing	1.3.4	G	AO												
		16120A	SD-03 Product Data															
			Installation Instructions	2.2	G	AO												
			SD-06 Test Reports															
			Tests, Inspections, and	2.3	G	AO												
			Verifications															
		16375A	SD-02 Shop Drawings															
			Electrical Distribution System	3.10.3	G	AE												
			As-Built Drawings		G	AE												
			SD-03 Product Data															
			Fault Current Analysis		G	AO												
			Protective Device		G	AO												
			Coordination Study		G	AO												
			Nameplates	2.2	G	AO												
			Material and Equipment	2.1	G	AO												
			General Installation Requirements	3.1	G	AO												
			SD-06 Test Reports															
			Factory Tests	2.15	G	AO												
			Field Testing	3.10	G	AO												
			Operating Tests	3.10.7	G	AO												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Chapel Center, Buckley AFB, Colorado

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY						REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16375A	Cable Installation	3.2.1.4	G	AO												
			SD-07 Certificates															
			Material and Equipment	2.1	G	AO												
			Cable Joints	3.3	G	AO												
			Cable Installer Qualifications		G	AO												
			SD-10 Operation and Maintenance															
			Data															
			Electrical Distribution System	3.10.3	G	AO												
		16403A	SD-02 Shop Drawings															
			Drawings	2.4.2	G	AE												
			Shop Drawings	2.2.1	G	AE												
			Switchboards	2.5	G	AE												
			Panelboards	2.6	G	AE												
			SD-03 Product Data															
			Equipment	1.4	G	AE												
			Factory Tests	2.8	G	AO												
			SD-06 Test Reports															
			Factory Tests	2.8	G	AO												
		16415A	SD-02 Shop Drawings															
			Interior Electrical Equipment		G	AE												
			SD-03 Product Data															
			Fault Current and Protective		G	AO												
			Device Coordination Study															
			Manufacturer's Catalog		G	AO												
			Material, Equipment, and Fixture		G	AO												
			Lists															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Chapel Center, Buckley AFB, Colorado

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16415A	Installation Procedures		G	AO												
			As-Built Drawings	1.2.6	G	AO												
			Onsite Tests	3.23.2	G	AO												
			SD-06 Test Reports															
			Factory Test Reports		G	AO												
			Field Test Plan		G	AO												
			Field Test Reports	3.21	G	AO												
			SD-07 Certificates															
			Materials and Equipment	1.4	G	AO												
		16528A	SD-02 Shop Drawings															
			Lighting System	1.3.1	G	AE												
			Detail Drawings		G	AO												
			SD-03 Product Data															
			Equipment and Materials	1.3.5	G	AE												
			Spare Parts		G	AO												
			SD-06 Test Reports															
			Operating Test	3.12.1	G	AO												
			Ground Resistance	3.12.2	G	AO												
			Measurements															
			SD-10 Operation and Maintenance															
			Data															
			Lighting System	1.3.1	G	AO												
		16710A	SD-02 Shop Drawings															
			Premises Distribution System	1.7	G	AE												
			Installation	3.1	G	AO												
			SD-03 Product Data															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Chapel Center, Buckley AFB, Colorado

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16710A	Record Keeping and	1.8	G	AO												
			Documentation															
			Spare Parts	3.1.9	G	AO												
			Manufacturer's Recommendations	3.1.2	G	AO												
			Test Plan	3.6	G	AO												
			Qualifications	1.5	G	AO												
			SD-06 Test Reports															
			Test Reports	3.6	G	AO												
			SD-07 Certificates															
			Premises Distribution System	1.7	G	AO												
			Materials and Equipment	2.1	G	AO												
			Installers	1.5.1	G	AO												
		16711A	SD-02 Shop Drawings															
			Telephone System		G	AE												
			Installation	3.1	G	AO												
			Record Drawings		G	AO												
			SD-03 Product Data															
			Spare Parts		G	AO												
			Equipment	1.5.2	G	AE												
			Installation	3.1	G	AO												
			Acceptance Tests	3.5	G	AO												
			Cutover and Records	3.4	G	AO												
			SD-06 Test Reports															
			Acceptance Tests	3.5	G	AO												
			SD-07 Certificates															
			Telephone System		G	AO												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Chapel Center, Buckley AFB, Colorado

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		16711A	Qualifications	1.4	G	AO												

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SPECWORKS # 32063

HW SET: 01
EXTERIOR ALUMINUM DOORS: ENTRY WITH ADA OPERATOR

DOOR NUMBER:
002A

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (NL)		B/O
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	AUTO DOOR OPERATOR	4642	695	LCN
2	EA	ACTUATOR	7910-972-4 X 7910-956	630	LCN
1	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
2	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O
2	EA	ASTRAGAL	DOOR MFG STANDARD INTEGRAL ASTRAGAL		B/O

NOTE: ADA OPERATOR TO FUNCTION IN SEQUENCE, WITH DOOR 003A USING 3 BUTTON ACTUATOR SYSTEM. 1-BUTTON EXTERIOR, 1-BUTTON VESTIBULE SIDE AND 1-BUTTON NARTHEX 003 SIDE.

HW SET: 02
EXTERIOR ALUMINUM DOORS: ENTRY, MULTI-PURPOSE,

DOOR NUMBER:
002B 021E

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
2	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
2	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
2	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
2	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
2	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O
2	EA	ASTRAGAL	DOOR MFG STANDARD INTEGRAL ASTRAGAL		B/O

HW SET: 03
ALUMINUM DOORS: NARTHEX (ADA OPERATOR)

DOOR NUMBER:
003A

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
2	EA	PUSH/PULL	DOOR MFG DUMMY PANIC DEVICE		B/O
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	AUTO DOOR OPERATOR	4642	695	LCN
1	EA	ACTUATOR	7910-972-4 X 7910-956	630	LCN
2	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
2	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O
2	EA	ASTRAGAL	DOOR MFG STANDARD INTEGRAL ASTRAGAL		B/O

HW SET: 04
ALUMINUM DOORS: NARTHEX, VESTIBULE

DOOR NUMBER:
003B 038A

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
2	EA	PUSH/PULL	DOOR MFG DUMMY PANIC DEVICE		B/O
2	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
2	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
2	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
2	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O
2	EA	ASTRAGAL	DOOR MFG STANDARD INTEGRAL ASTRAGAL		B/O

HW SET: 05
EXTERIOR ALUMINUM DOORS: HALL,

DOOR NUMBER:
007A 040A

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
1	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O

HW SET: 06
EXTERIOR ALUMINUM DOORS: MULTI-PURPOSE,

DOOR NUMBER:
020B 021C 021F

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
1	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O

HW SET: 07
EXTERIOR ALUMINUM DOORS: NAVE

DOOR NUMBER:
029G

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
1	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O

HW SET: 08
EXTERIOR HOLLOW METAL DOORS: BIKE STORAGE

DOOR NUMBER:
015A 063A

EACH TO HAVE:

4	EA	BUTT HINGE	3CB1HW NRP (A5111)	630	IVE
1	EA	STOREROOM LOCK	LM581-DN (F07-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	PA1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	WEATHERSTRIP	45041CP (R3A265E)	719	PEM
1	EA	DOOR BOTTOM	3452CP (R3A535E)	719	PEM
1	EA	THRESHOLD	2005AT (J35100)	719	PEM
1	EA	LOCK GUARD	LG12	630	IVE

HW SET: 09
EXTERIOR HOLLOW METAL DOORS: MECHANICAL

DOOR NUMBER:
016A 065A

EACH TO HAVE:

8	EA	BUTT HINGE	3CB1HW NRP (A5111)	630	IVE
1	SET	MANUAL FLUSH BOLT	FB457 (LO4251)	626	IVE
1	EA	DUST PROOF STRIKE	DP1 (L14011)	626	IVE
1	EA	STOREROOM LOCK	LM581-DN (F07-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
2	EA	KICKPLATE	8400 254MM X 25MM LDW (J102)	630	IVE
2	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	WEATHERSTRIP	45041CP (R3A265E)	719	PEM
2	EA	DOOR BOTTOM	3452CP (R3A535E)	719	PEM
1	EA	THRESHOLD	2005AT (J35100)	719	PEM
1	EA	ASTRAGAL/SEAL	357SP (R0Y615E) X S88D (ROY154)	600	PEM

GENERAL CONTRACTOR NOTE: SET FRAME AND INSTALL DOOR AND HARDWARE FOR 180-DEGREE DOOR SWING.

HW SET: 10
EXTERIOR ALUMINUM DOORS: HALL ENTRY 020, VEST. 053,

DOOR NUMBER:
020A 053A

EACH TO HAVE:

2	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (DT)		B/O
1	EA	PANIC DEVICE	DOOR MFG INTEGRAL PANIC DEVICE (NL)		B/O
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
2	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
2	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
2	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O
2	EA	ASTRAGAL	DOOR MFG STANDARD INTEGRAL ASTRAGAL		B/O

HW SET: 11
EXTERIOR HOLLOW METAL DOORS: ELECTRICAL

DOOR NUMBER:
064A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1HW NRP (A5111)	630	IVE
1	EA	PANIC DEVICE	18-R-P-APOLLO (GRADE 1 TYPE 1 FUNCTION 03)	630	MON
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
1	EA	SURFACE CLOSER	PA1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	WEATHERSTRIP	45041CP (R3A265E)	719	PEM
1	EA	DOOR BOTTOM	3452CP (R3A535E)	719	PEM
1	EA	THRESHOLD	2005AT (J35100)	719	PEM

GENERAL CONTRACTOR NOTE: SET FRAME AND INSTALL DOOR AND HARDWARE FOR 180-DEGREE DOOR SWING.

HW SET: 12
MULTI-PURPOSE

DOOR NUMBER:
021B

EACH TO HAVE:

6	EA	BUTT HINGE	3CB1HW (A8111)	652	IVE
1	EA	PANIC DEVICE	18-R-P-APOLLO (GRADE 1 TYPE 1 FUNCTION 03)	630	MON
1	EA	PANIC DEVICE	18-R-T-APOLLO (GRADE 1 TYPE 1 FUNCTION 02)	630	MON
1	EA	KEY REM MULLION	CR4023 (GRADE 1 TYPE 22)	MAL	MON
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
2	EA	SURFACE CLOSER	PA1370-HO (HOLD OPEN ARM) (CO3021-PT:4C, 4D)	689	LCN
2	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
2	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
2	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM
2	EA	SOUND SEAL	S88D (ROY154) 2 VERTICAL STRIPS ON MULLION		PEM

HW SET: 13
MULTI-PURPOSE

DOOR NUMBER:
021A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1HW (A8111)	652	IVE
1	EA	PANIC DEVICE	18-R-P-APOLLO (GRADE 1 TYPE 1 FUNCTION 03)	630	MON
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
1	EA	SURFACE CLOSER	PA1370-HO (HOLD OPEN ARM) (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 14
STORAGE

DOOR NUMBER:
026A

EACH TO HAVE:

6	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
2	SET	MANUAL FLUSH BOLT	FB458 (LO4251)	626	IVE
1	EA	DUST PROOF STRIKE	DP1 (L14011)	626	IVE
1	EA	STOREROOM LOCK	LM581-DN (F07-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	PA1370-HO (HOLD OPEN ARM) (CO3021-PT:4C, 4D)	689	LCN
2	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
2	EA	KICKPLATE	8400 254MM X 25MM LDW (J102)	630	IVE
2	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SMOKE SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM
1	EA	ASTRAGAL/SEAL	357SP (R0Y615E) X S88D (ROY154)	600	PEM

HW SET: 15
NAVE

DOOR NUMBER:
029C 029D

EACH TO HAVE:

8	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
2	EA	PANIC DEVICE	18-V-DT-APOLLO (LBR) (GRADE 1 TYPE 2-FUN 02)	630	MON
2	EA	SURFACE CLOSER	PA1370-HO (HOLD OPEN ARM) (CO3021-PT:4C, 4D)	689	LCN
2	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
2	EA	KICKPLATE	8400 254MM X 25MM LDW (J102)	630	IVE
1	EA	FLOOR STOP	FB438	626	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM
2	EA	BRUSH ASTRAGAL	29324CP (ROY734)	719	PEM

HW SET: 16
NAVE

DOOR NUMBER:
029A 029F

EACH TO HAVE:

4	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	PANIC DEVICE	18-R-P-APOLLO (GRADE 1 TYPE 1 FUNCTION 03)	630	MON
1	EA	RIM CYLINDER	1E72 (7 PIN) (E09221)	626	BES
1	EA	SURFACE CLOSER	PA1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 17
NAVE

DOOR NUMBER:
029B 029E

EACH TO HAVE:

4	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	PANIC DEVICE	18-R-T-APOLLO (GRADE 1 TYPE 1 FUNCTION 02)	630	MON
1	EA	SURFACE CLOSER	PA1370-HO (HOLD OPEN ARM) (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 18
CLASSROOMS, LIBRARY, CONF, MOBILITY, KITCHEN, STORAGE,

DOOR NUMBER:
023A 024B 025A 041 042 043
046A 048A 050A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	CLASSROOM LOCK	LM561-DN (F05-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

PROVIDE SOUND SEAL AT DOORS: 023A, 024B AND 048A.

HW SET: 19
NURSERY, TODDLER, 2-3, 4-5,

DOOR NUMBER:
004A 006A 008A 010A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	CLASSROOM LOCK	LM561-DN (F05-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	FINGER GUARD	700 (HEIGHT OF DOOR)	AL	LCN
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

HW SET: 20
CHOIR/CLASSROOM, MULTI-MEDIA, CRY,

DOOR NUMBER:
017A 027A 028A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	CLASSROOM LOCK	LM561-DN (F05-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 21
STORAGE, JANITOR,

DOOR NUMBER:
014A 015A 019A 022A 032B

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	STOREROOM LOCK	LM581-DN (F07-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

HW SET: 22
ADMINISTRATION

DOOR NUMBER:
044A 051A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1HW (A8111)	652	IVE
1	EA	CLASSROOM LOCK	LM561-DN (F05-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	AIR SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 23
COUNTER ROLL-UP DOOR

DOOR NUMBER:
024A

EACH TO HAVE:

EA	BY DOOR MFG	ALL HARDWARE BY DOOR MANUFACTURER		B/O

NO OUTSIDE LOCKING, LOCKING FROM KITHEN SIDE ONLY.

HW SET: 24
OFFICES,

DOOR NUMBER:
018A 054 055 056A 057A 058A
060A 061A 062A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	OFFICE LOCK	LM521-DN (FO4-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 25
TOILET, CHANGING,

DOOR NUMBER:
033A 036A 037A 052A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	PRIVACY SET	LM311-DN (F19-1)	626	FAL
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 26
CHILDREN'S TOILETS

DOOR NUMBER:
005A 005B 009A 009B

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	LATCHSET	LM101-DG (F01-1)	626	FAL
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	EA	FINGER GUARD	700 (HEIGHT OF DOOR)	AL	LCN
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

HW SET: 27
SACRISTY

DOOR NUMBER:
031A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	LATCHSET	LM101-DG (F01-1)	626	FAL
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

HW SET: 28
SHOWER

DOOR NUMBER:
013A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	HOTEL LOCK	LM451-DN (F15-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 29
WOMENS TOILET

DOOR NUMBER:
011A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	CLASSROOM LOCK	LM561-DN (F05-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	SURFACE CLOSER	1370 (CO3021-PT:4C, 4D)	689	LCN
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SOUND SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 30
FOLDING PARTITION DOORS

DOOR NUMBER:
021G 021H 021I 021J 021K 021L

EACH TO HAVE:

1	EA	BY DOOR MFG	ALL HARDWARE BY DOOR MANUFACTURER		B/O

HW SET: 31
STORAGE, JANITOR,

DOOR NUMBER:
039A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1HW (A8111)	652	IVE
1	EA	STOREROOM LOCK	LM581-DN (F07-1) (LESS CYLINDER)	626	FAL
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
1	SET	SMOKE SEAL	S88D (HEAD & JAMBS) (ROY154)	BRN	PEM

HW SET: 32
STORAGE WITH PUSHBUTTON COMBINATION LOCK

DOOR NUMBER:
049A

EACH TO HAVE:

3	EA	BUTT HINGE	3CB1 (A8112)	652	IVE
1	EA	COMBINATION LOCK	MPM-06	626	SCH
1	EA	MORTISE CYLINDER	1E74 (7 PIN) (E09211)	626	BES
1	EA	MOP PLATE	8400 200MM X 25MM LDW (J102)	630	IVE
1	EA	KICKPLATE	8400 254MM X 50MM LDW (J102)	630	IVE
1	EA	WALL STOP	WS406 (LO2101)	630	IVE
3	EA	SILENCER	SR64 (LO3011)	GRY	IVE

HW SET: 33
EXTERIOR ALUMINUM DOOR, MULTI-PURPOSE, COMBINATION ACCESS
REQUIRES 4-1/2 INCH RAIL WITH 299 STRIKE
REQUIRES 3-13/16 INCH RAIL WITH 1409 STRIKE

DOOR NUMBER:
021D

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	DOOR MFG STANDARD CONTINUOUS HINGE		B/O
1	EA	PANIC DEVICE	98-E0 (PREP FOR PRO993 TRIM)		VON
1	EA	COMBINATION LOCK	PRO993-06-LC	626	LOC
1	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	TOP JAMB CLOSER	TJ1370 (CO3041-PT:4C, 4D)	695	LCN
1	EA	CLOSER BRACKET	1370-18TJ AS REQUIRED	695	LCN
1	EA	OVERHEAD STOP	900-S (CO2541)	695	GLY
1	EA	THRESHOLD	DOOR MFG STANDARD THRESHOLD (J35100)		B/O
1	SET	WEATHERSTRIP	DOOR MFG STANDARD INTEGRAL WEATHERSTRIP		B/O
1	EA	DOOR BOTTOM	DOOR MFG STANDARD DOOR BOTTOM		B/O

-- End Section --

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13110A

CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)

11/98

-- End of Section Table of Contents --

SECTION 13110A

CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE)
11/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM B 418	(2001) Cast and Wrought Galvanic Zinc Anodes
ASTM B 843	(1993; R 2003) Magnesium Alloy Anodes for Cathodic Protection
ASTM D 1248	(2002) Polyethylene Plastics Extrusion Materials for Wire and Cable

NACE INTERNATIONAL (NACE)

NACE RP0169	(2002) Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0177	(2000) Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems
NACE RP0188	(1999) Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
NACE RP0190	(1995) External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA TC 2	(2003) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit
NEMA WC 5	(1992; Rev 2 1996) Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2002) National Electrical Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards

UNDERWRITERS LABORATORIES (UL)

UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 514A	(1996; Rev thru Nov 2001) Metallic Outlet Boxes
UL 6	(2000; Rev thru May 2003) Rigid Metal Conduit

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G, AO

Six copies of detail drawings consisting of a complete list of equipment and material including manufacturer's descriptive and technical literature, catalog cuts, results of system design calculations including soil-resistivity, installation instructions and certified test data stating the maximum recommended anode current output density and the rate of gaseous production if any at that current density. Detail drawings shall contain complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will function properly as a unit.

Contractor's Modifications; G, AO

Six copies of detail drawings showing proposed changes in location, scope of performance indicating any variations from, additions to, or clarifications of contract drawings. The drawings shall show proposed changes in anode arrangement, anode size and number, anode materials and layout details, conduit size, wire size, mounting details, wiring diagram, method for electrically-isolating each pipe, and any other pertinent information to proper installation and performance of the system.

SD-03 Product Data

Equipment; G, AO

Within 30 days after receipt of notice to proceed, an itemized list of equipment and materials including item number, quantity, and manufacturer of each item. The list shall be accompanied by a

description of procedures for each type of testing and adjustments, including testing of coating for thickness and holidays. Installation of materials and equipment shall not commence until this submittal is approved.

Spare Parts; G, AO

Spare parts data for each different item of material and equipment specified, after approval of detail drawings and not later than six (6) months prior to the date of beneficial occupancy. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. One (1) spare anode of each type shall be furnished.

SD-06 Test Reports

Tests and Measurements; G, AO

Test reports in booklet form tabulating all field tests and measurements performed, upon completion and testing of the installed system and including close interval potential survey, casing and interference tests, final system test verifying protection, insulated joint and bond tests, and holiday coating test. A certified test report showing that the connecting method has passed a 120-day laboratory test without failure at the place of connection, wherein the anode is subjected to maximum recommended current output while immersed in a three percent sodium chloride solution.

Contractor's Modifications; G, AO

Final report regarding Contractor's modifications. The report shall include pipe-to-soil measurements throughout the affected area, indicating that the modifications improved the overall conditions, and current measurements for anodes. The following special materials and information are required: taping materials and conductors; zinc grounding cell, installation and testing procedures, and equipment; coating material; system design calculations for anode number, life, and parameters to achieve protective potential; backfill shield material and installation details showing waterproofing; bonding and waterproofing details; insulated resistance wire; exothermic weld equipment and material.

SD-07 Certificates

Cathodic Protection System; G, AO

Proof that the materials and equipment furnished under this section conform to the specified requirements contained in the referenced standards or publications. The label or listing by the specified agency will be acceptable evidence of such compliance.

Services of "Corrosion Expert"; G, AO

Evidence of qualifications of the "corrosion expert."

a. The "corrosion expert's" name and qualifications shall be certified in writing to the Contracting Officer prior to the start of construction.

b. Certification shall be submitted giving the name of the firm, the number of years of experience, and a list of not less than five (5) of the firm's installations three (3) or more years old that have been tested and found satisfactory.

SD-10 Operation and Maintenance Data

Cathodic Protection System; G, AO

Before final acceptance of the cathodic protection system, six copies of operating manuals outlining the step-by-step procedures required for system startup, operation, adjustment of current flow, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance manual, listing routine maintenance procedures, recommendation for maintenance testing, possible breakdowns and repairs, and troubleshooting guides. The manuals shall include single-line diagrams for the system as installed; instructions in making pipe-to-reference cell and tank-to-reference cell potential measurements and frequency of monitoring; instructions for dielectric connections, interference and sacrificial anode bonds; instructions shall include precautions to ensure safe conditions during repair of pipe or other metallic systems. The instructions shall be neatly bound between permanent covers and titled "Operating and Maintenance Instructions." These instructions shall be submitted for the Contracting Officer's approval. The instructions shall include the following:

a. As-built drawings, to scale of the entire system, showing the locations of the piping, location of all anodes and test stations, locations of all insulating joints, and structure-to-reference cell potentials as measured during the tests required by Paragraph: TESTS AND MEASUREMENTS, of this section.

b. Recommendations for maintenance testing, including instructions in making pipe-to-reference cell potential measurements and frequency of testing.

c. All maintenance and operating instructions and nameplate data shall be in English.

d. Instructions shall include precautions to insure safe conditions during repair of pipe system.

Training Course; G, AO

The proposed Training Course Curriculum (including topics and dates of discussion) indicating that all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions, are to be covered.

1.3 GENERAL REQUIREMENTS

The Contractor shall design, furnish and install a complete, operating, sacrificial anode cathodic protection system in complete compliance with NFPA 70, with all applicable Federal, State, and local regulations and with minimum requirements of this contract. In addition to the minimum requirements of these specifications, construction of gas pipelines and associated cathodic protection systems shall be in compliance with 49 CFR 192 . The services required include planning, installation, adjusting and testing of a cathodic protection system, using sacrificial anodes for cathodic protection of the Water Fire Protection Gas lines, their connectors and lines under the slab or floor foundation. The cathodic protection system shall include anodes, cables, connectors, corrosion protection test stations, and any other equipment required for a complete operating system providing the NACE criteria of protection as specified. Insulators are required whenever needed to insulate the pipes from any other structure. Any pipe crossing the protected pipes shall have a test station. The cathodic protection shall be provided on Water, Fire Protection, and Gas Gas pipes.

1.3.1 Services of "Corrosion Expert"

The Contractor shall obtain the services of a "corrosion expert" to design, supervise, inspect, and test the installation and performance of the cathodic protection system. "Corrosion expert" refers to a person, who by thorough knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. Such a person must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection (CP) Specialist or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metallic systems, if such certification or licensing includes 5 years experience in corrosion control on underground metallic surfaces of the type under this contract. The "corrosion expert" shall make at least 3 visits to the project site. The first of these visits shall include obtaining soil resistivity data, acknowledging the type of pipeline coatings to be used and reporting to the Contractor the type of cathodic protection required. Once the submittals are approved and the materials delivered, the "corrosion expert" shall revisit the site the ensure the Contractor understands installation practices and laying out the components. The third visit shall involve testing the installed cathodic protection systems and training applicable personnel on proper maintenance techniques. The "corrosion expert" shall supervise installation and testing of all cathodic protection.

1.3.2 Contractor's Modifications

The specified system is based on a complete system with magnesium sacrificial anodes. The Contractor must design the cathodic protection system after review of the project, site verification, and analysis. The design shall be fully described, and shall be approved by the Contracting Officer's representative, and shall meet the following criteria. The proposed system shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolts with reference to a saturated copper-copper sulfate reference cell on the underground components of the piping or other metallic surface. The Contractor shall take resistivity measurements of the soil in the vicinity of the pipes and ground bed sites.

Based upon the measurements taken, the current and voltage shall be required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential shall be obtained over 95 percent of the metallic area. The anode system shall be designed for a life of twenty-five (25) years of continuous operation.

1.3.3 Isolators

Isolators are required to insulate the indicated pipes from any other structure.

1.3.4 Anode and Bond Wires

Magnesium anodes of the number indicated below with an unpackaged weight of 7.7 kilograms shall be provided uniform distances along the following indicated metallic pipe lines:

DESCRIPTION	APPROXIMATE LENGTH	NUMBER OF ANODES
200 mm WATERLINE	120 meters	4
100 mm WATERLINE	20 meters	1
200 mm FIRE WATER	20 meters	1
200 mm WATERLINE	100 meters	3
200 mm WATERLINE	120 meters	4
50 mm GAS LINE	250 meters	2

A minimum of 1 test station shall be used for these anodes. These anodes indicated above shall be in addition to anodes for the pipe under concrete slab and casing requirements. For each cathodic system, the metallic components and structures to be protected shall be made electrically continuous. This shall be accomplished by installing bond wires between the various structures. Bonding of existing buried structures may also be required to preclude detrimental stray current effects and safety hazards. Provisions shall be included to return stray current to its source without damaging structures intercepting the stray current. The electrical isolation of underground facilities in accordance with acceptable industry practice shall be included under this section. All tests shall be witnessed by the Contracting Officer.

1.3.5 Summary of Services Required

The scope of services shall include, but shall not be limited to, the following:

a. Close-interval potential surveys and design.

b. Cathodic Protection Systems.

c. System testing.

d. Casing corrosion control.

e. Interference testing.

f. Training.

g. Operating and maintenance manual.

h. Insulator testing and bonding testing.

i. Coating and holiday testing shall be submitted within 45 days of notice to proceed.

1.3.6 Nonmetallic Pipe System

In the event pipe other than metallic pipe is approved and used in lieu of metallic pipe, all metallic components of this pipe system shall be protected with cathodic protection. Detailed drawings of cathodic protection for each component shall be submitted to the Contracting Officer for approval within 45 days after date of receipt of notice to proceed, and before commencement of any work.

1.3.6.1 Coatings

Coatings for metallic components shall be as required for metallic fittings. Protective covering (coating and taping) shall be completed and tested on each metallic component (such as valves, hydrants and fillings). This covering shall be as required for underground metallic pipe. Each test shall be witnessed by the Contracting Officer. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications. The use of nonmetallic pipe does not change other requirements of the specifications. Any deviations due to the use of nonmetallic pipe shall be submitted for approval.

1.3.6.2 Tracer Wire

When a nonmetallic pipe line is used to extend or add to an existing metallic line, an insulated No. 8 AWG copper wire shall be thermit-welded to the existing metallic line and run the length of the new nonmetallic line. This wire shall be used as a locator tracer wire and to maintain continuity to any future extensions of the pipe line.

1.3.7 Tests of Components

A minimum of four (4) tests shall be made at each metallic component in the piping system. Two (2) measurements shall be made directly over the anodes and the other two (2) tests shall be over the outer edge of the component, but at the farthest point from the anodes. Structure and pipes shall be shown with the cathodic protection equipment. All components of the cathodic protection system shall be shown on drawings, showing their relationship to the protected structure or component. A narrative shall describe how the cathodic protection system will work and provide testing at each component. Components requiring cathodic protection shall include but not be limited to the following:

a. Pipes under the floor slab or foundations.

b. PIV.

c. Shutoff valves.

d. Metallic pipe extended from aboveground locations.

e. Each connector or change-of-direction device.

f. Any metallic pipe component or section.

g. Backflow preventor.

1.3.8 Drawings

Detailed drawings shall be provided showing location of anodes, insulated fittings, test stations, permanent reference cells, and bonding. Locations shall be referenced to two (2) permanent facilities or mark points.

1.3.9 Electrical Potential Measurements

All potential tests shall be made at a minimum of 10 foot intervals witnessed by the Contracting Officer. Submittals shall identify test locations on separate drawing, showing all metal to be protected and all cathodic protection equipment. Test points equipment and protected metal shall be easily distinguished and identified.

1.3.10 Achievement of Criteria for Protection

All conductors, unless otherwise shown, shall be routed to or through the test stations. Each system provided shall achieve a minimum pipe-to-soil "instant off" potential of minus 850 millivolt potentials with reference to a saturated copper-copper-sulfate reference cell on all underground components of the piping. Based upon the measurements taken, the current and voltage of the anodes should be adjusted as required to produce a minimum of minus 850 millivolts "instant off" potential between the structure being tested and the reference cell. This potential should be obtained over 95 percent of the metallic area. This must be achieved without the "instant off" potential exceeding 1150 millivolts. Testing will be witnessed by the Contracting Officer. Additional anodes shall be provided by the Contractor if required to achieve the minus 850 millivolts "instant off". Although acceptance criteria of the cathodic protection systems are defined in NACE RP0169, for this project the "instant off" potential of minus 850 millivolts is the only acceptable criteria.

1.3.11 Metallic Components and Typicals

a. Metallic components: As a minimum, each metallic component shall be protected with two (2) magnesium anodes. This number of anodes is required to achieve minus 850 millivolts "instant off" potential on the metallic area and at the same time not provide overvoltage above 1150 millivolts "instant off." As a minimum, the magnesium anode unpackaged weight shall be 17 pounds. The magnesium anodes shall be located on each side of the metallic component and routed through a test station.

b. Fire Hydrants: Fire hydrant pipe components shall have a minimum of two (2) anodes. These magnesium anodes shall have an unpackaged weight of 17 pounds.

c. Pipe Under Concrete Slab: Pipe under concrete slab shall have a minimum of 2 magnesium anodes. These magnesium anodes shall have an unpackaged weight of 17 pounds. Pipe under concrete slab shall have 2 permanent reference electrodes located under the slab. One (1) permanent reference electrode shall be located where the pipe enters the concrete slab. All conductors shall be routed to a test station.

d. Valves: Each valve shall be protected with 1 magnesium anodes. The magnesium anode shall have an unpackaged weight of 17 pounds.

e. Metallic Pipe Component or Section: Each section of metallic

pipe shall be protected with 2 magnesium anodes. The magnesium anodes shall have an unpackaged weight of 17 pounds.

f. Connectors or Change-of-Direction Devices: Each change-of-direction device shall be protected with 2 magnesium anodes. The magnesium anode shall have an unpackaged weight of 17 pounds.

1.3.12 Metallic Component Coating

Coatings for metallic components shall be as required for metallic fittings as indicated. This will include fire hydrants, T's, elbows, valves, etc. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified in these specifications.

PART 2 PRODUCTS

2.1 MAGNESIUM ANODES

A minimum of 13 anodes shall be installed on the waterline system. See Paragraph METALLIC COMPONENTS AND TYPICALS for additional anodes under slab.

2.1.1 Anode Composition

Anodes shall be of high-potential magnesium alloy, made of primary magnesium obtained from sea water or brine, and not made from scrap metal. Magnesium anodes shall conform to ASTM B 843 and to the following analysis (in percents) otherwise indicated:

Aluminum, max.	0.010
Manganese, max.	0.50 to 1.30
Zinc	0.05
Silicon, max.	0.05
Copper, max.	0.02
Nickel, max.	0.001
Iron, Max.	0.03
Other impurities, max.	0.05 each or 0.3 max. total
Magnesium	Remainder

The Contractor shall furnish spectrographic analysis on samples from each heat or batch of anodes used on this project.

2.1.2 Dimensions and Weights

Dimensions and weights of anodes shall be approximately as follows:

TYPICAL MAGNESIUM ANODE SIZE

(Cross sections may be round, square, or D shaped)

NOMINAL WT. LBS.	APPROX. SIZE (IN)	NOMINAL GROSS WT lb PACKAGED IN BACKFILL	NOMINAL PACKAGE DIMENSIONS (IN)
3	3 X 3 X 5	8	5-1/4 X 5-1/4 X 8
5	3 X 3 X 8	13	5-1/4 X 5-1/4 X 11-1/4
9	3 X 3 X 14	27	5-1/4 X 20
12	4 X 4 X 12	32	7-1/2 X 18
17	4 X 4 X 17	45	7-1/2 X 24

TYPICAL MAGNESIUM ANODE SIZE

	(Cross sections may be round, square, or D shaped)		
32	5 X 5 X 20-1/2	68	8-1/2 X 28
50	7 X 7 X 16	100	10 X 24

2.1.3 Packaged Anodes

Anodes shall be provided in packaged form with the anode surrounded by specially-prepared quick-wetting backfill and contained in a water permeable cloth or paper sack. Anodes shall be centered by means of spacers in the backfill material. The backfill material shall have the following composition, unless otherwise indicated:

Material	Approximate Percent by Weight
Gypsum	75
Bentonite	20
Sodium Sulphate	5
Total	100

2.1.4 Zinc Anodes

Zinc anodes shall conform to ASTM B 418, Type II.

2.1.5 Connecting Wire

2.1.5.1 Wire Requirements

Wire shall be No. 12 AWG solid copper wire, not less than 10 feet long, unspliced, complying with NFPA 70, Type TW insulation. Connecting wires for magnesium anodes shall be factory installed with the place or emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

2.1.5.2 Anode Header Cable

Cable for anode header and distribution shall be No. 6 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64 inch thick insulation, 600-volt rating, in accordance with NEMA WC 5.

2.2 MISCELLANEOUS MATERIALS

2.2.1 Electrical Wire

Wire shall be No. 12 AWG stranded copper wire with NFPA 70, Type RHW-USE insulation. Polyethylene insulation shall comply with the requirements of ASTM D 1248 and shall be of the following types, classes, and grades:

High-molecular weight polyethylene shall be Type I, Class C, Grade E5.

High-density polyethylene shall be Type III, Class C, Grade E3.

2.2.1.1 Wire Splicing

Connecting wire splicing shall be made with copper compression connectors or exothermic welds, following instructions of the manufacturer. Single split-bolt connections shall not be used. Sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated

wires entering the spliced joints and epoxy potting compound shall be as specified below.

2.2.1.2 Test Wires

Test wires shall be AWG No. 12 stranded copper wire with NFPA 70, Type TW or RHW or polyethylene insulation.

2.2.1.3 Resistance Wire

Resistance wire shall be AWG No. 16 or No. 22 nickel-chromium wire.

2.2.2 Conduit

Rigid galvanized steel conduit and accessories shall conform to UL 6. Non metallic conduit shall conform to NEMA TC 2.

2.2.3 Test Boxes and Junctions Boxes

Boxes shall be outdoor type conforming to UL 514A.

2.2.4 Joint, Patch, Seal, and Repair Coating

Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 1/2-inch thick. Coating compound shall be cold-applied coal-tar base mastic . Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.2.5 Backfill Shields

Shields shall consist of approved pipeline wrapping or fiberglass-reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose and installed in accordance with the manufacturer's recommendations. When joint bonds are required, due to the use of mechanical joints, the entire joint shall be protected by the use of a kraft paper joint cover. The joint cover shall be filled with poured-in, hot coat-tar enamel.

2.2.6 Epoxy Potting Compound

Compound for encapsulating electrical wire splices to be buried underground shall be a two package system made for the purpose.

2.2.7 Test Stations

Stations shall be of the flush-curb-box type and shall be the standard product of a recognized manufacturer. Test stations shall be complete with an insulated terminal block having the required number of terminals. The test station shall be provided with a lockable over and shall have an embossed legend, "C.P. Test." A minimum of one (1) test station shall be provided each component of the pipe . A minimum of six (6) terminals shall be provided in each test station. A minimum of two (2) leads are required to the metallic pipe from each test station. Other conductors shall be provided for each anode, other foreign pipe, and reference cells as required. Test stations may be constructed of nonmetallic materials. However, if nonmetallic materials are utilized, as a minimum, the materials shall be resistant to damage from ultraviolet radiation, contain good color

retention qualities, contain high strength qualities, and be resistant to accidental or vandalistic impacts that might be normally encountered in the environment for which they are to be installed. The test stations shall be listed for the particular application for which they are to be utilized.

2.2.8 Joint and Continuity Bonds

Bonds shall be provided across all joints in the metallic water and gas lines, across any electrically discontinuous connections and all other pipes and structures with other than welded or threaded joints that are included in this cathodic protection system. Unless otherwise specified in the specifications, bonds between structures and across joints in pipe with other than welded or threaded joints shall be No. 8 AWG stranded copper cable with polyethylene insulation. Bonds between structures shall contain sufficient slack for any anticipated movement between structures. Bonds across pipe joints shall contain a minimum of 4 inches of slack to allow for pipe movement and soil stress. Bonds shall be attached by exothermic welding. Exothermic weld areas shall be insulated with coating compound and approved, and witnessed by the Contracting Officer. Continuity bonds shall be installed as necessary to reduce stray current interference. Additional joint bondings shall be accomplished by the Contractor where the necessity is discovered during construction or testing or where the Contracting Officer's representative directs that such bonding be done. Joint bonding shall include all associated excavation and backfilling. There shall be a minimum of two (2) continuity bonds between each structure and other than welded or threaded joints. The Contractor shall test for electrical continuity across all joints with other than welded or threaded joints and across all metallic portions or components. The Contractor shall provide bonding as required and as specified above until electrical continuity is achieved. Bonding test data shall be submitted for approval.

2.2.9 Resistance Bonds

Resistance bonds should be adjusted as outlined in this specification. Alternate methods may be used if they are approved by the Contracting Officer.

2.2.10 Stray Current Measurements

Stray current measurements should be performed at each test station. Stray currents resulting from lightning or overhead alternating current (AC) power transmission systems shall be mitigated in accordance with NACE RP0177.

2.2.11 Electrical Isolation of Structures

As a minimum, isolating flanges or unions shall be provided at the following locations:

a. Connection of new metallic piping or components to existing piping.

b. Pressure piping under floor slab to a building.

Isolation shall be provided at metallic connection of all lines to existing system and where connecting to a building. Additionally, isolation shall be provided between water and/or gas line; and foreign pipes that cross the new lines within 10 feet. Isolation fittings, including isolating flanges and couplings, shall be installed aboveground or in a concrete pit.

2.2.11.1 Electrically Isolating Pipe Joints

Electrically isolating pipe joints shall be of a type that is in regular factory production.

2.2.11.2 Electrically Conductive Couplings

Electrically conductive couplings shall be of a type that has a published maximum electrical resistance rating given in the manufacturer's literature. Cradles and seals shall be of a type that is in regular factory production made for the purpose of electrically insulating the carrier pipe from the casing and preventing the incursion of water into the annular space.

2.2.11.3 Insulating Joint Testing

A Model 601 Insulation Checker, as manufactured by "Gas Electronics", , or an approved equal, shall be used for insulating joint (flange) electrical testing.

2.2.12 Underground Structure Coating

This coating specification shall take precedence over any other project specification and drawing notes, whether stated or implied, and shall also apply to the pipeline or tank supplier. No variance in coating quality shall be allowed by the Contractor or Base Construction Representative without the written consent of the designer. All underground metallic pipelines and tanks to be cathodically protected shall be afforded a good quality factory-applied coating. This includes all carbon steel, cast-iron and ductile-iron pipelines or vessels. Coatings shall be selected, applied, and inspected in accordance with NACE RP0190 and as specified. If non-metallic pipelines are installed, all metallic fittings on pipe sections shall be coated in accordance with this specification section.

a. The nominal thickness of the metallic pipe joint or other component coating shall be 1.0 mm, plus or minus 5 percent.

b. Pipe and joint coating for factory applied or field repair material shall be applied as recommended by the manufacturer and shall be one of the following:

(1) Continuously extruded polyethylene and adhesive coating system.
(2) Polyvinyl chloride pressure-sensitive adhesive tape.
(3) High density polyethylene/bituminous rubber compound tape.
(4) Butyl rubber tape.
(5) Coal tar epoxy.

2.2.12.1 Field Joints

All field joints shall be coated with materials compatible with the pipeline coating compound. The joint coating material shall be applied to an equal thickness as the pipeline coating. Unbonded coatings shall not be used on these buried metallic components. This includes the elimination of all unbonded polymer wraps or tubes. Once the pipeline or vessel is set in the trench, an inspection of the coating shall be conducted. This inspection shall include electrical holiday detection. Any damaged areas of the coating shall be properly repaired. The Contracting Officer shall be asked to witness inspection of the coating and testing using a holiday

detector.

2.2.12.2 Inspection of Pipe Coatings

Any damage to the protective covering during transit and handling shall be repaired before installation. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer's representative to determine suitability of the detector. All labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor.

a. Protective covering for aboveground piping system: Finish painting shall conform to the applicable paragraph of SECTION: 09900, PAINTS AND COATINGS, and as follows:

b. Ferrous surfaces: Shop-primed surfaces shall be touched-up with ferrous metal primer. Surfaces that have not been shop-primed shall be solvent-cleaned. Surfaces that contain loose rust, loose mil scale, and other foreign substances shall be mechanically-cleaned by power wire-brushing and primed with ferrous metal primer. Primed surface shall be finished with two (2) coats of exterior oil paint and vinyl paint. Coating for each entire piping service shall be an approved pipe line wrapping having a minimum coating resistance of 50,000 Ohms per square foot.

2.2.13 Resistance Wire

Wire shall be No. 16 or No. 22 nickel-chromium wire with TW insulation.

2.2.14 Electrical Connections

Electrical connections shall be done as follows:

a. Exothermic welds shall be "Cadweld"," Bundy", "Thermoweld" or an approved equal. Use of this material shall be in strict accordance with the manufacturer's recommendations.

b. Electrical-shielded arc welds shall be approved for use on steel pipe by shop drawing submittal action.

c. Brazing shall be as specified in Paragraph: Lead Wire Connections.

2.2.15 Electrical Tape

Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

2.2.16 Permanent Reference Electrodes

Permanent reference electrodes shall be Cu-CuS04 electrodes suitable for direct burial. Electrodes shall be guaranteed by the supplier for 15 years' service in the environment in which they shall be placed. Electrodes shall be installed directly beneath pipe, or metallic component.

2.2.17 Casing

Where a pipeline is installed in a casing under a roadway or railway, the pipeline shall be electrically insulated from the casing, and the annular space sealed and filled with an approved corrosion inhibiting product against incursion of water.

PART 3 EXECUTION

3.1 CRITERIA OF PROTECTION

Acceptance criteria for determining the adequacy of protection on a buried underground pipe and metallic component shall be in accordance with NACE RP0169 and as specified below.

3.1.1 Iron and Steel

The following method (a) shall be used for testing cathodic protection voltages. If more than one method is required, method (b) shall be used.

a. A negative voltage of at least minus 850 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode connecting the earth (electrolyte) directly over the underground component. Determination of this voltage shall be made with the cathodic protection system in operation. Voltage drops shall be considered for valid interpretation of this voltage measurement. A minimum of minus 850 millivolts "instant off" potential between the underground component being tested and the reference cell shall be achieved over 95 percent of the area of the structure. Adequate number of measurements shall be obtained over the entire structure, pipe, tank, or other metallic component to verify and record achievement of minus 850 millivolts "instant off." This potential shall be obtained over 95 percent of the total metallic area without the "instant off" potential exceeding 1200 millivolts.

b. A minimum polarization voltage shift of 100 millivolts as measured between the underground component and a saturated copper-copper sulphate reference electrode contacting the earth directly over the underground component. This polarization voltage shift shall be determined by interrupting the protective current and measuring the polarization decay. When the protective current is interrupted, an immediate voltage shift will occur. The voltage reading, after the immediate shift, shall be used as the base reading from which to measure polarization decay. Measurements achieving 100 millivolts decay shall be made over 95 percent of the metallic surface being protected.

c. For any metallic component, a minimum of four (4) measurements shall be made using subparagraph (a), above, and achieving the "instant off" potential of minus 850 millivolts. Two (2) measurements shall be made over the anodes and two (2) measurements shall be made at different locations near the component and farthest away from the anode.

3.1.2 Copper Piping

For copper piping, the following criteria shall apply: A minimum of 100 millivolts of cathodic polarization between the structure surface and a stable reference electrode contacting the electrolyte. The polarization voltage shift shall be determined as outlined for iron and steel.

3.2 ANODE STORAGE AND INSTALLATION

3.2.1 Anode Storage

Storage area for magnesium anodes will be designated by the Contracting Officer. If anodes are not stored in a building, tarps or similar protection should be used to protect anodes from inclement weather. Packaged anodes, damaged as a result of improper handling or being exposed to rain, shall be resacked by the Contractor and the required backfill added.

3.2.2 Anode Installation

Unless otherwise authorized, installation shall not proceed without the presence of the Contracting Officer. Anodes of the size specified shall be installed to the depth indicated and at the locations shown. Locations may be changed to clear obstructions with the approval of the Contracting Officer. Anodes shall be installed in sufficient number and of the required type, size, and spacing to obtain a uniform current distribution over the surface of the structure. The anode system shall e designed for a life of 25 years of continuous operation. Anodes shall be installed as indicated in a dry condition after any plastic or waterproof protective covering has been completely removed from the water permeable, permanent container housing the anode metal. The anode connecting wire shall not be used for lowering the anode into the hole. The annular space around the anode shall be backfilled with fine earth in 6 inch layers and each layer shall be hand tamped. Care must be exercised not to strike the anode or connecting wire with the tamper. Approximately 5 gallonsof water shall be applied to each filled hole after anode backfilling and tamping has been completed to a point about 6inches above the anode. After the water has been absorbed by the earth, backfilling shall be completed to the ground surface level.

3.2.2.1 Single Anodes

Single anodes, spaced as shown, shall be connected through a test station to the pipeline, allowing adequate slack in the connecting wire to compensate for movement during backfill operation.

3.2.2.2 Groups of Anodes

Groups of anodes, in quantity and location shown, shall be connected to an anode header cable. The anode header cable shall make contact with the structure to be protected only through a test station. Anode lead connection to the anode header cable shall be made by an approved crimp connector or exothermic weld and splice mold kit with appropriate potting compound.

3.2.2.3 Welding Methods

Connections to ferrous pipe shall be made by exothermic weld methods manufactured for the type of pipe supplied. Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

3.2.3 Anode Placement - General

Packaged anodes shall be installed completely dry, and shall be lowered

into holes by rope sling or by grasping the cloth gather. The anode lead wire shall not be used in lowering the anodes. The hole shall be backfilled with fine soil in 6inch layers and each layer shall be hand-tamped around the anode. Care must be exercised not to strike the anode or lead wire with the tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 6 inches above the anode. Approximately 2 gallons of water may be poured into the hole. After the water has been absorbed by the soil, backfilling and tamping may be completed to the top of the hole. Anodes shall be installed as specified or shown. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anodes may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

3.2.4 Underground Pipeline

Anodes shall be installed at a minimum of 8 feet and a maximum of 10 feet from the line to be protected.

3.2.5 Installation Details

Details shall conform to the requirements of this specification. Details shown on the drawings are indicative of the general type of material required, and are not intended to restrict selection to material of any particular manufacturer.

3.2.6 Lead Wire Connections

3.2.6.1 Underground Pipeline (Metallic)

To facilitate periodic electrical measurements during the life of the sacrificial anode system and to reduce the output current of the anodes, if required, all anode lead wires shall be connected to a test station and buried a minimum of 24 inches in depth. The cable shall be No. 10 AWG, stranded copper, polyethylene or RHW-USE insulated cable. The cable shall make contact with the structure only through a test station. Resistance wire shall be installed between the cable and the pipe cable, in the test station, to reduce the current output, if required. Anode connections, except in the test station, shall be made with exothermic welding process, and shall be insulated by means of at least three (3) layers of electrical tape; and all lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin. Lead wire-to-structure connections shall be accomplished by an exothermic welding process. All welds shall be in accordance with the manufacturer's recommendations. A backfill shield filled with a pipeline mastic sealant or material compatible with the coating shall be placed over the weld connection and shall be of such diameter as to cover the exposed metal adequately.

3.2.6.2 Resistance Wire Splices

Resistance wire connections shall be accomplished with silver solder and the solder joints wrapped with a minimum of three (3) layers of pressure-sensitive tape. Lead wire connections shall be installed in a moistureproof splice mold kit and filled with epoxy resin.

3.2.7 Location of Test Stations

Test stations shall be of the type and location shown and shall be curb box mounted. Buried insulating joints shall be provided with test wire

connections brought to a test station. Unless otherwise shown, other test stations shall be located as follows:

a. At 1,000-foot intervals or less.

b. Where the pipe or conduit crosses any other metal pipe.

c. At both ends of casings under roadways and railways.

d. Where both sides of an insulating joint are not accessible above ground for testing purposes.

3.2.8 Underground Pipe Joint Bonds

Underground pipe having other than welded or threaded coupling joints shall be made electrically continuous by means of a bonding connection installed across the joint.

3.3 ELECTRICAL ISOLATION OF STRUCTURES

3.3.1 Isolation Joints and Fittings

Isolating fittings, including main line isolating flanges and couplings, shall be installed aboveground, or within manholes, wherever possible. Where isolating joints must be covered with soil, they shall be fitted with a paper joint cover specifically manufactured for covering the particular joint, and the space within the cover filled with hot coal-tar enamel. Isolating fittings in lines entering buildings shall be located at least 12 inches above grade of floor level, when possible. Isolating joints shall be provided with grounding cells to protect against over-voltage surges or approved surge protection devices. The cells shall provide a low resistance across isolating joint without excessive loss of cathodic current.

3.3.2 Gas Distribution Piping

Electrical isolation shall be provided at each building riser pipe to the pressure regulator, at all points where a short to another structure or to a foreign structure may occur, and at other locations as indicated on the drawings.

3.4 TRENCHING AND BACKFILLING

Trenching and backfilling shall be in accordance with Section 02300 EARTHWORK.

3.5 TESTS AND MEASUREMENTS

3.5.1 Baseline Potentials

Each test and measurement will be witnessed by the Contracting Officer. The Contractor shall notify the Contracting Officer a minimum of five (5) working days prior to each test. After backfill of the pipe , the static potential-to-soil of the pipe shall be measured. The locations of these measurements shall be identical to the locations specified for pipe-to-reference electrode potential measurements. The initial measurements shall be recorded.

3.5.2 Isolation Testing

Before the anode system is connected to the pipe, an isolation test shall be made at each isolating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two isolated sections of the pipe. Any isolating fittings installed and found to be defective shall be reported to the Contracting Officer.

3.5.2.1 Insulation Checker

A Model 601 insulation checker, as manufactured by "Gas Electronics", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. Testing shall conform to the manufacturer's operating instructions. Test shall be witnessed by the Contracting Officer. An isolating joint that is good will read full scale on the meter. If an isolating joint is shorted, the meter pointer will be deflected or near zero on the meter scale. Location of the fault shall be determined from the instructions, and the joint shall be repaired. If an isolating joint is located inside a vault, the pipe shall be sleeved with insulator when entering and leaving the vault.

3.5.2.2 Cathodic Protection Meter

A Model B3A2 cathodic protection meter, as manufactured by "M.C. Miller", or an approved equal, using the continuity check circuit, shall be used for isolating joint (flange) electrical testing. This test shall be performed in addition to the Model 601 insulation checker. Continuity is checked across the isolation joint after the test lead wire is shorted together and the meter adjusted to scale. A full-scale deflection indicates the system is shorted at some location. The Model 601 verifies that the particular insulation under test is good and the Model B3A2 verifies that the system is isolated. If the system is shorted, further testing shall be performed to isolate the location of the short.

3.5.3 Anode Output

As the anodes or groups of anodes are connected to the pipe , current output shall be measured with an approved clamp-on milliammeter, calibrated shunt with a suitable millivoltmeter or multimeter, or a low resistance ammeter. (Of the three methods, the low-resistance ammeter is the least desirable and most inaccurate. The clamp-on milliammeter is the most accurate.) The valves obtained and the date, time, and location shall be recorded.

3.5.4 Reference Electrode Potential Measurements

Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct-current voltmeter having an internal resistance (sensitivity) of not less than 10 megohms per volt and a full scale of 10 volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded. No less than eight (8) measurements shall be made over any length of line or component. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

3.5.5 Location of Measurements

3.5.5.1 Piping or Conduit

For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Pipe-to-soil potential measurements shall be made at intervals not exceeding 10 feet. The Contractor may use a continuous pipe-to-soil potential profile in lieu of 5 foot interval pipe-to-soil potential measurements. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line adjacent to the riser. Potentials shall be plotted versus distance to an approved scale. Locations where potentials do not meet or exceed the criteria shall be identified and reported to the Contracting Officer's representative.

3.5.5.2 Casing Tests

Before final acceptance of the installation, the electrical separation of carrier pipe from casings shall be tested and any short circuits corrected.

3.5.5.3 Interference Testing

Before final acceptance of the installation, interference tests shall be made with respect to any foreign pipes in cooperation with the owner of the foreign pipes . A full report of the tests giving all details shall be made. Stray current measurements shall be performed at all isolating locations and at locations where the new pipeline crosses foreign metallic pipes. The method of measurements and locations of measurements shall be submitted for approval. As a minimum, stray current measurements shall be performed at the following locations:

a. Connection point of new pipeline to existing pipeline.

b. Crossing points of new pipeline with existing lines.

Results of stray current measurements shall also be submitted for approval.

3.5.5.4 Holiday Test

Any damage to the protective covering during transit and handling shall be repaired before installation. After field-coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed current in accordance with NACE RP0188 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. Holidays in the protective covering shall be repaired upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector. Labor, materials, and equipment necessary for conducting the inspection shall be furnished by the Contractor. The coating system shall be inspected for holes, voids, cracks, and other damage during installation.

3.5.5.5 Recording Measurements

All pipe-to-soil potential measurements, including initial potentials where required, shall be recorded. The Contractor shall locate, correct and report to the Contracting Officer any short circuits to foreign pipes

encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements shall be taken on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

3.6 TRAINING COURSE

The Contractor shall conduct a training course for the operating staff as designated by the Contracting Officer. The training period shall consist of a total of 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations, including testing procedures included in the maintenance instructions. At least 14 days prior to date of proposed conduction of the training course, the training course curriculum shall be submitted for approval, along with the proposed training date. Training shall consist of demonstration of test equipment, providing forms for test data and the tolerances which indicate that the system works.

3.7 CLEANUP

The Contractor shall be responsible for cleanup of the construction site. All paper bags, wire clippings, etc., shall be disposed of as directed. Paper bags, wire clippings and other waste shall not be put in bell holes or anodes excavation.

3.8 MISCELLANEOUS INSTALLATION AND TESTING

3.8.1 Coatings

All aboveground pipeline shall be coated as indicated or as approved. The coating shall have a minimum thickness of 7 mil. The pipeline coating shall be in accordance with all applicable Federal, State, and local regulations.

3.8.2 Excavation

In the event rock is encountered in providing the required depth for anodes, the Contractor shall determine an alternate approved location and, if the depth is still not provided, an alternate plan shall be submitted to the Contracting Officer. Alternate techniques and depths must be approved prior to implementation.

3.9 SPARE PARTS

After approval of shop drawings, and not later than three (3) months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply. In addition, the Contractor shall supply information for material and equipment replacement for all other components of the complete system, including anodes, cables, splice kits and connectors, corrosion test stations, and any other components not listed above.

3.10 SEEDING

Seeding shall be done by the Contractor, as directed, in all unsurfaced locations disturbed by this construction. In areas where grass cover

exists, it is possible that sod can be carefully removed, watered, and stored during construction operations, and replaced after the operations are completed since it is estimated that no section of pipeline should remain uncovered for more than two (2) days. The use of sod in lieu of seeding shall require approval by the Contracting Officer.

3.11 SYSTEM TESTING

The Contractor shall submit a report including potential measurements taken at adequately-close intervals to establish that minus 850 millivolts potential, "instant-off" potential, is provided, and that the cathodic protection is not providing interference to other foreign pipes causing damage to paint or pipes. The report shall provide a narrative describing how the criteria of protection is achieved without damaging other pipe or structures in the area.

3.12 CLEARING OF TREES AND UNDERBRUSH

In the areas of the anode beds, all trees and underbrush shall be cleared and grubbed to the limits shown or indicated.

-- End of Section --